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ABSTRACT

This study developed and field tested instructional units designed to help young adult farmers use farm management principles in decision making. Relationships were also sought between farmers' personal characteristics and their posttest scores. Ten teachers of vocational agriculture (Group A) received inservice training in using the instructional units; nine (Group B) received printed instructions but no training. A control group of nine teachers was also used. The units dealt with the relationship of goals to decision making, the principle of diminishing returns, fixed and variable costs, substitution, opportunity costs, and profitable enterprise combinations. A multiple choice posttest measured the farmers' understanding. Special questionnaires were used to determine the backgrounds and reactions of the farmers and their teachers. Prepared instructional units proved more effective than traditional methods. Group A slightly surpassed Group B, which in turn surpassed the control group. Young adult farmers' managerial and marital status, educational background, age and experience, and (for experimental subjects) the number of farm management meetings attended, were related to posttest scores. Teachers and students reacted favorably to most aspects of the instructional units. (LY)

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Final Report

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William E. Drake
Harry E. Peirce

Cornell University
Ithaca, New York

August 1969

U. S. DEPARTMENT OF
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FINAL REPORT

THE DEVELOPMENT AND EVALUATION OF FARM MANAGEMENT INSTRUCTIONAL UNITS FOR YOUNG ADULT FARMER EDUCATION

Harry E. Peirce
William E. Drake

Project No. 8-B-097
Grant No. OEG-2-9-420097-1004-(010)

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CHAPTER I

THE PROBLEM AND ITS SETTING

Statement of the Problem

American agriculture has been changing rapidly in recent years due to technological, economic and social developments. It is estimated that agricultural technology doubles each ten years and that many practices and machines become obsolete in five.[1] Rising production costs and increased processing expenses are steadily narrowing the farmer's profit margin. Fewer farmers are now being called upon to produce more food and fiber on larger farm units but with less acres in the aggregate. The challenge of larger farm businesses, greater financial acumen, and the latest technology is placing an even greater premium on efficient management of resources. The farmer is constantly faced with decisions which must be made correctly if he is to maintain his role as a productive citizen in today's society.

This situation poses one of the most serious problems confronting today's farmer, that is, "how to efficiently organize and use resources available to him. Right decisions result in a good chance in making money while wrong decisions lead to failure."[2]

A knowledge of farm management principles and their application enables farmers to determine the most favorable relationship between inputs and outputs and therefore enables them to make wise decisions

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1. C. E. Bundy, "Technical Education for Farmers," Agricultural Education Magazine, Vol. 40, No. 8, (February, 1968), p. 181.

2. Harold F. Duis, "A New Approach to Teaching Farm Management is Necessary," Agricultural Education Magazine, Vol. 36, No. 3, (September, 1963), p. 51.

regarding the use of their resources. Educators in agriculture should provide instructional programs for adult and young farmers that have a greater emphasis on the application of farm management principles to decision making.

The central problem of this study was to measure the effectiveness of instructional units which are designed to enable young adult farmers to improve their ability to use farm management principles when making decisions.

Related Research and Need for the Study

Public education institutions in the United States initially began to meet the educational needs of farmers in 1862 with the creation of the Department of Agriculture and the passage of the Land-Grant College Act. Subsequent legislation that was significant to agriculture education included (1) The Hatch Act in 1887 that created the agricultural experiment stations, (2) The Smith-Lever Agricultural Extension Act of 1914, and (3) The Smith-Hughes Act of 1917 (supplemented - 1946 by the George-Barden Act). The two most recent acts "gave great encouragement to the growth of vocational agriculture education on the secondary level"[3] and post high school level.

In 1963 President Kennedy's Panel for Vocational Education recommended that "changes should be made in existing programs to bring them more clearly into accord with present day needs . . . present restrictions should be changed to recognize that agriculture is no longer based on production alone and that vocational agriculture education should provide increased emphasis on management . . . "[4] Before such changes are to be made, however, the panel "gave agriculture educators and other vocational educators a mandate to research, develop, and evaluate their programs."[5] Congress concurred with this mandate and passed the Vocational Act of 1963 which, among other provisions, called for research, development and evaluation of educational materials and programs.

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[3] J. Paul Leagans, "Agriculture Education," Encyclopedia Americana, Vol. 1, (New York: Americana, 1966), p. 245.

It was no surprise that agricultural educators were receptive to the mandate for change as they had originally played a key role on the President's Panel. Leaders in agriculture education have generally taken a pragmatic approach toward their curriculum. They are cognizant of educational innovations and of the fact that their end product should be an individual who has been trained in decision making. Until recently, however, vocational agriculture teachers have too often focused their farm management instruction for adult and young farmers on enterprise and production practices without looking at the entire farm as an economic unit. Glenn S. Pound, Dean of the College of Agriculture at the University of Wisconsin, was recently quoted as saying that, "Our curriculum emphasis must be more and more in the principles and concepts and less on technology and species management."[6] Richards also supports this concept by stating,

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[4] U. S. Department of Health, Education and Welfare, Education for a Changing World, (Washington: U.S. Government Printing Office, 1963), p. 206.

[5] Lloyd J. Phipps, "Needed Research and Development," Agricultural Education Magazine, Vol. 38, No. 5, (November, 1965), p. 101.

[6] Glenn S. Pound, "Should Agricultural Students Study Farming?" Crops and Soils, (February, 1967), p. 5.

"It has long been established that agriculture is based on fundamental scientific facts and practices in agriculture are determined by these underlying scientific principles whether it be in production, processing, distribution or any other segment of the agriculture industry. Let us remember that a practice may become outdated before it is ever put to use."[7] The person who learns the simple 'what' and 'how' of a skill situation without the basic principle of 'why' is extremely limited educationally. Today's economy forces the farmer to make logical, well planned decisions based on proven farm management principles.

Recent research involving agricultural education programs in Ohio by Mathis[8] and Rolloff[9] indicates that the 'farm management principle approach' to adult and young farmer education is effective in improving the farmer's managerial ability. If a farmer can learn to approach a decision in a logical manner, i.e., an approach that utilizes basic, time tested farm management principles, he can use this approach with all management decisions regardless of the type of farming in which he is engaged. This approach improves the farmer's mobility from one decision to the next. The value of knowledge of farm management principles is evident in the wide range of income among farmers with similar resources. The farmer who has the best understanding of farm management principles and knows how to apply them to his farm business decisions is the most successful.

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[7] C. E. Richard, "Teaching Basic Principles in Science in the Vocational Agriculture Curriculum," Agricultural Education Magazine, Vol. 36, No. 7, (January, 1964), p. 130.

[8] Gilbert L. Mathis, "Managerial Perception and Success in Farming," Ph.D. Dissertation, Ohio State University, 1966.

[9] John A. Rolloff, "The Development of a Model Design to Assess Instruction in Terms of Economic Returns and the Understanding of Economic Principles," Ph.D. Dissertation, Ohio State University, 1966.

The purpose of the Mathis study was to contribute to the improvement of programs of instruction in farm management for young farmers by determining the relationship between the perception young farmers have of themselves as entrepreneurs and their success in farming as measured by monetary and nonmonetary criteria. He found a definite positive correlation between managerial perception and success in farming.

Rolloff's study revealed two relevant findings. Instruction in the Ohio Farm Business Planning and Analysis Program was effective in improving the mean understanding of profit maximizing principles. There was also, in the aggregate, a positive association between changes accruing to farm operators in their understanding of profit maximizing economic principles and the changes in their economic efficiency. These findings legitimize the importance and relevance of farm management instruction. Farm operators who receive farm management instruction improve their understanding of production principles and subsequently utilize their resources more efficiently and raise their net farm income.

Several other recent studies have concentrated on the development of high school level instructional materials that stress the use of economic principles. Menno Lovenstein developed a course covering the broad areas of economics designed for ninth grade high school students. His basic approach was to demonstrate the value of structure in the teaching of economics.[10]

McGuire at Purdue developed and tested four modules of instruction for eleventh and twelfth grade students in vocational agriculture that dealt with basic production economics such as the law of supply and demand, value theory, the law of variable proportion, and marginal analysis.[11]

Barker at Ohio felt that these units were too broad for his desired purpose so he developed units of instruction that stressed the specific economic principle aspect of production.[12] He used the inductive method of instruction in order to develop an understanding of the following profit-maximizing principles: diminishing returns, fixed-variable costs, substitution, opportunity costs, combination of enterprises and time relationships. These principles were previously identified by McCormick as having application to the operation and management of an agricultural business.[13]

A review of the developments in agriculture education revealed a greater current emphasis on farm management principles in the

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10. Menno Lovenstein, et.al., "Development of Economic Curricular Materials for Secondary Schools, "Report of a Cooperative Research Project Sponsored by the U.S.O.E., (Columbus: The Ohio State University Research Foundation, 1966).

11. James E. McGuire, "Teaching Basic Economic Production Principles to Secondary School Student of Vocational Agriculture: An Evaluative Case Study," Ph.D. dissertation, Purdue University, 1966.

12. Richard L. Barker, "An Appraisal of Instructional Units to Enhance Student Understanding of Profit Maximizing Principles," Ph.D. dissertation, Ohio State University, 1967.

13. Floyd J. McCormick, "The Development of an Instrument for Measuring the Understanding of Profit Maximizing Principles," Ph.D. dissertation, Ohio State University, 1964.

curriculum for adult and young farmers. This review also revealed a dearth of teaching aids that emphasize the farm management principle approach to young adult farmer education.

A preliminary survey of agriculture teachers in New York revealed that only 14 percent of the agriculture departments emphasized farm management in their instruction to young farmers. Leaders in agriculture education are concerned about this minimal effort and would like to determine ways to increase the emphasis on farm management instruction. McCormick recommended that agricultural leaders "augment research in the area of farm management instruction in order to determine such things as:

a. How to apply economic principles to the farming operation.
b. What farmers really want in the way of farm management instruction.
c. The best procedure for teaching economic principles.
d. How to make farm management instruction more palatable for young and adult farmers."[14]

Barker concluded that the cause of the deficiency in farm management instruction "remains to a large extent, due to the lack of teacher understanding and insufficient instructional materials."[15] Brickell also alluded to the importance of providing instructional materials to teachers in his recommendations for organizing New York State for educational change. He found that "the surest way to guarantee the successful introduction of a new program is to supply teachers with all the help they need in moving into the new approach."[16]

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[14] Floyd J. McCormick, "Use New Funds . . . Strengthen Farm Management Instruction," Agricultural Education Magazine, Vol. 38, No. 2, (August, 1965), p. 42.

[15] Barker, p. 3.

A summary of recent research studies reveals, therefore, that (a) the farm management principles approach is effective, and (b) some farm management principle instructional units at the secondary level have been prepared. However, there is a need for instructional units which vocational agriculture teachers can readily understand and use in their young adult farmer classes. The purpose of this project was to fulfill this need.

Specific Objectives

The study was designed to achieve the following specific objectives:

1. To develop farm management principle instructional units which vocational agriculture teachers can use in their young adult farmer classes.
2. To determine which of three instructional approaches results in the greatest level of young adult farmer understanding of farm management principles.
3. To measure the relationship between the young adult farmer level of understanding farm management principles and the following independent variables:
    a. Young adult farmer's age
    b. Years of managerial responsibility

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[16] Henry M. Brickell, Organizing New York State for Educational Change, (State Education Department, Albany, New York, 1961), p. 31.

   c. Status - owner, part-owner, tenant, partner, hired hand, working at home
   d. Size of business - work units
   e. Marital status
   f. Formal education
   g. Years enrolled in vocational agriculture
   h. Part-time or full-time farmer
   i. Interest in self-improvement - number of farm magazines read, number of farm radio programs he listens to and farm TV programs he watches
   j. Number of farm management meetings attended in current course
   k. Length of instruction time
   l. Length of time between first instructional unit and post-test
   m. Age of teacher
   n. Years of teaching vocational agriculture
   o. Single or multiple teacher department
   p. Advanced degree (teacher - yes or no)

4. To conduct a teacher appraisal of the developed instructional units.
5. To conduct a young adult farmer appraisal of the developed instructional units.

Hypotheses

In the development of this study, three major hypotheses were formulated for testing. They were:

1. Young adult farmers who receive farm management instruction by the farm management principle approach that is utilized in the developed instructional units will have a greater level of understanding farm management principles than those who are instructed in the usual farm management manner as measured by a posttest instrument developed by McCormick[17] to measure the understanding of farm management principles. This hypothesis can also be expressed as: $H_1 \quad \overline{X}_A > \overline{X}_C$ and $H_1 \quad \overline{X}_B > \overline{X}_C$.
2. Young adult farmers who receive the farm management principle approach to farm management instruction from teachers who had received prior instruction on the use of the developed instructional units, $\overline{X}_A$, will have a greater understanding of farm management principles than those who received instruction from teachers who had not received prior instruction on the use of the developed instructional units, $\overline{X}_B$, as measured by McCormick's posttest instrument. This can also be expressed as $H_2 \quad \overline{X}_A > \overline{X}_B$.
3. There will be a relationship between the independent variables and the level of understanding farm management principles as measured by McCormick's posttest instrument.

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[17] McCormick, "The Development of an Instrument for Measuring the Understanding of Profit Maximizing Principles."

Basic Assumptions

The following basic assumptions are accepted as fundamental to this study:

1. A knowledge of the basic farm management principles will improve the young adult farmer's ability to make managerial decisions.
2. McCormick's instrument used in this study is valid in measuring the understanding of farm management principles.
3. The criteria used for selecting the experimental and control schools in this study will provide an adequate randomization.
4. The findings and recommendations resulting from this study with young adult farmers can be generalized to young farmer and adult farmer education programs elsewhere because of the following reasons:
    a. The knowledge of farm management principles will enable any farmer to make sound decisions regarding the use of his resources.
    b. There is a similarity between young adult farmers in the State of New York and young farmers and adult farmers elsewhere.

Limitations

This study was affected by the following limitations:

1. Vocational agriculture teachers vary in their understanding of farm management principles and in their ability to teach farm management.
2. The time and ability of teachers in the experimental schools to understand and use the developed instructional units.
3. The number of young adult farmers participating in the study.

4. The validity and reliability of information received from experimental and control schools pursuant to the independent variables.
5. The possibility of transfer of instructional treatment information between the experimental and control groups.

Operational Definitions

1. Young adult farmer: a young man in the process of becoming established in farming who is enrolled in a young farmer program offered by the local vocational agriculture department. According to a recent study, beginning dairy farmers in New York State have a mean age of 26 within a range of 17 - 39, are married (80%), and have an average of 2 children.[18]
2. Farm management principle: a generalized statement, assumed to be true, which provides an accepted guideline to sound decision making which affects the profitability of a farm business.
3. Farm management principles instructional units: teaching units which were developed and served as a basis for this study. These units were based on the following farm management principles: diminishing returns, fixed-variable costs, substitution, opportunity costs, and combination of enterprises. The knowledge of these principles is considered by leading farm management authorities to be paramount to the farmer as he makes

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[18] C. W. Hill, et.al., The Educational Needs of Beginning Dairy Farm Operators in New York, (Ithaca: New York State College of Agriculture, Cornell University, 1966), Agricultural Experiment Station Bulletin 1008.

decisions regarding the use of his resources.

4. Level of understanding: a concept developed to express the extent of knowledge of basic economic principles possessed by young adult farmers within the sample as measured by a posttest.

5. Usual manner of farm management instruction: refers to the approach usually used by New York teachers of agriculture in teaching farm management to young adult farmers. Farm business analysis, record keeping, finance and management of enterprises are usually covered by lecture and discussion methods using a wide range of instructional time. The young adult farmer is encouraged to use the New York Farm Business Chart as a comparative means of determining the strong and weak areas of his farm business.

6. Control school: a school used in this study in which no attempt was made to deviate from the usual program of farm management instruction.

7. Experimental school: a school used in this study where the teacher of vocational agriculture used the instructional units prepared for teaching farm management principles. Experimental Group A teachers received instruction on the use of the prepared units prior to their use at an in-service training meeting. Experimental Group B teachers used the units according to the printed instructions without the benefit of an in-service training meeting.

8. Participating school and teacher: a control or experimental school and the teacher at this school in the State of New York cooperating in the trial use of the developed instructional units of farm management principles or teaching farm management in their usual manner.

CHAPTER II

INVESTIGATION PROCEDURES

The primary purpose of this study was to develop and field-test farm management instructional units which vocational agriculture teachers can use in their young adult farmer classes. Three approaches to farm management instruction were appraised as they were influenced by sixteen independent variables to accomplish this purpose.

Development of Instructional Units

The first objective of this study was to develop farm management principle instructional units which vocational agriculture teachers can use in their young adult farmer classes. The principle investigator developed the farm management instructional units by (a) a careful perusal of existing instructional units, (b) enlisting advice from agricultural education and farm management authorities, and (c) drawing upon his own background of 17 years as a vocational agriculture teacher and farm management consultant.

The prepared units were titled "Using Farm Management Principles When Making Decisions" and were designed to be presented in three meetings. The first unit stressed the relationship of goals to decision making. The second unit illustrated the principle of diminishing returns and the concept of fixed-variable costs while the third unit illustrated the principles of substitution and opportunity costs and the concept of profitable enterprise combinations.

Instructional Unit Outline

The following format was used in each of the three instructional units:

1. Unit objective
2. Decisions to be made
3. Factors affecting the decision
4. Topical outline
5. Introduction
6. Farm management principle
7. Examples that illustrate the principle
8. Discussion questions
9. Conclusions
10. Additional applications of the principle
11. References

Unit Objectives - The objectives of each unit contributed to the ultimate objective of enabling young adult farmers to improve their ability to use farm management principles when making decisions.

Decisions and Factors - Each unit had major decisions. If the young adult farmer made these decisions correctly they would ultimately lead to the achievement of the unit objective. The factors that were listed with each unit were suggested as pertinent considerations that influence the decision to be made.

Topical Outline - The topical outline is a list of the teaching procedures to be followed. It revealed to the teacher an overview of the major divisions of the instructional unit.

Introduction - The introduction of each unit was designed to focus the young adult farmers' attention on the importance of the relationship of that particular farm management principle or concept to decision making.

Farm Management Principle - The farm management principles and concepts were presented in terms that are familiar to the young farmer. The term "farm management principle" was used throughout the instructional units in lieu of the longer more appropriate phrase "basic economic principles used when making farm management decisions."

Examples that Illustrate the Principle - Several examples were given to illustrate each farm management principle. These examples were taken from ordinary farm situations and presented in laymen's terms. The learning principle of apperception was utilized with these examples as the young adult farmers were enabled to perceive the new in terms of the old. Acetate overhead projectuals were prepared to supplement the instructor's presentation of the examples.

Discussion Questions - The discussion questions were intended to stimulate thinking and activity on the part of the young adult farmer. The teacher was also encouraged to add additional questions that would be pertinent to the season and location.

Conclusions - Several conclusions were drawn from each example in order to illustrate the relationship between the example and the farm management principle or concept.

Additional Applications of the Principle - In addition to the illustrated examples, there was a list of additional decisions where the application of the principle or concept would apply. The young adult farmers were also encouraged to think of additional applications of the principle.

References - A list of farm management references pertinent to each principle and concept was available at the end of each instructional unit. The teacher was encouraged to become familiar with this resource material in order to gain a better understanding of the applications of farm management principles.

Jury of Consultants

The prepared units were submitted to a jury of consultants for constructive criticism. Members of the jury of consultants, each knowledgeable in the fields of farm management and/or agriculture education, included Dr. Richard L. Barker, Director of the New Hampshire Research Coordinating Unit; Dr. Milo J. Peterson, Chairman of the Agriculture Education Department, University of Minnesota; Dr. Philip Teske, Specialist in Instructional Materials and Practices, U.S. Office of Education; Charles S. Wiggins, New York Agricultural Education Bureau; Professor C.A. Bratton, Agriculture Economics Department, Cornell University and the following members of the Agriculture Education Division, Cornell University: Professor Joe P. Bail, Professor William E. Drake, and Lyle Wicks.

The consultants were requested to comment particularly on the following items in the instructional units: (1) the examples that were used to illustrate the farm management principles, (2) the discussion questions and conclusions, and (3) the exact wording.

The instructional units were subsequently revised according to the jury of consultants' suggestions and printed prior to distribution to participating teachers.

Summary of First Objective - The first objective of this study was to develop farm management principle instructional units which vocational agriculture teachers can use in their young adult farmer classes. The principal investigator prepared the instructional units and subsequently revised them according to suggestions from a jury of consultants. A copy of the instructional units is in Appendix A.

Selection of Sample

Preliminary Survey of Population

Agriculture teachers of New York State were surveyed by mail to determine if they offered instruction to young farmers during the 1967-68 school year. The Agricultural Education Division at Cornell University and the Bureau of Agricultural Education in the New York State Education Department assisted with this survey. Information derived from the preliminary survey was used to determine the target population of this study.

Population

All young adult farmers in New York State in the process of becoming established in farming comprise the population in this study.

Target Population

The target population for this study was comprised of the young adult farmers enrolled in young farmer programs offered by vocational agriculture departments of the State of New York which fit the following criteria:

1. The teacher conducted a young farmer program during the previous year.
2. The teacher planned to conduct a young farmer program during the current year.
3. There is a farm management emphasis in the young farmer curriculum.
4. The teacher is willing to participate in a young farmer farm management study.

One hundred and twenty-two of the 280 agriculture teachers in New York had previously conducted young farmer programs and consequently were surveyed. Twenty-eight teachers met the required criteria and consequently comprise the target population in this study. Their schools are geographically representative of New York State.

Sample Population

Stratified random sampling procedures were used to select from the target population, the teachers that would comprise the three groups in the sample population; Experimental Group A, Experimental Group B, and Control Group C. The criteria used in stratification were (a) geographic areas, (b) type of farming, (c) age and experience of teachers, and (d) proximity of the groups.

It was originally intended to select eight teachers for each of the three groups, however, it was later decided to utilize all twenty-eight teachers in the target population in order to allow for attrition. This proved to be a wise decision as seven of the twenty-eight teachers who began the study were unable to complete it for various reasons.

Ten teachers were selected for Experimental Group A. These teachers attended an in-service training workshop that prepared them to use the instructional units.

Nine teachers were selected for Experimental Group B. They used the instructional units according to the printed instructions that accompanied them and without the in-service training workshop.

Nine teachers were selected for Control Group C. These teachers taught farm management to young adult farmers in their usual manner, without the prepared instructional units that were used in the two experimental groups. A list of the teachers who participated in this study is in Appendix B.

In-Service Training Meetings

The purpose of the in-service training meetings was to give instruction to the teachers in Experimental Group A in the desired use of the prepared farm management instructional units.

The rationale for using two experimental groups was to determine if the teacher's instruction is significantly improved after receiving prior instruction on the use of the instructional units at an in-service training meeting. In-service training meetings were conducted for the teachers in Experimental Group A. One meeting was originally scheduled for these teachers, however, inclement weather prevented several from attending this meeting so two follow-up meetings were scheduled. The meetings were conducted at Lowville, New York November 18, West Winfield, New York, November 25, and Philadelphia, New York, December 4.

The following items were discussed at each of the in-service training meetings:

1. Purpose of the Study
2. Objectives of the instructional units
3. Examples used to illustrate the farm management principles
4. Use of the overhead projectuals
5. Use of the additional references
6. Use of the farm management post-test

The Principal Investigator conducted the meetings with assistance from Lyle Wicks, Instructional Materials Specialist at Cornell.

Visits to Participating Schools

The principal investigator visited all of the teachers in the study in order to (a) become acquainted with the instructional approach that was offered in the control schools, and (b) distribute the prepared instructional units to the teachers in the experimental groups.

There was a distinct farm management emphasis in the curricula offered by the teachers to the young adult farmers in the control schools. The following farm management topics were discussed in most of the control schools: record keeping, summarizing and analyzing the farm business, farm business inputs and outputs, and tax management. Other management topics mentioned less frequently were management goals, partnerships, estate planning, farm law and insurance. Enterprise management topics frequently discussed were dairy management, forages, grain crops and conservation.

The agriculture teachers in this project included farm management instruction in various parts of their curriculum. Most experimental group teachers, however, used the prepared farm management instructional units in a block of three consecutive meetings.

Development of Testing Instrument and Questionnaires

Preparation of Instruments

McCormick's testing instrument for measuring "Seven Profit Maximizing Principles"[19] was revised slightly to measure the young farmers' understanding of the following five farm management principles and concepts: diminishing returns fixed-variable costs, substitution, opportunity costs and combination of enterprises.

McCormick's testing instrument, "Multiple Choice Questions on Farming," consists of 45 multiple choice questions. Six questions pertaining to the concept of time relationships were eliminated from the exam to make it more appropriate for the instructional units used in this study. A copy of the revised testing instrument is enclosed in Appendix D of this study. Copies of the questionnaires are in Appendix D.

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[19] McCormick, "The Development of an Instrument for Measuring the Understanding of Profit Maximizing Principles."

McCormick's instrument was tested in 1963 on discriminate groups of efficient and non-efficient farm operators. They were selected from the Farmers Home Administration in Ohio on the basis of their farm management analysis data. The same instrument was also used by Rolloff[20] in 1966 in formulating a basis design to assess the relative degree of effectiveness of instruction in farm management. The validity and reliability of this exam have been evaluated and it has been determined as an appropriate instrument for measuring the level of a young adult farmer's understanding of farm management principles.

Questionnaires were also prepared to determine the young farmers' and teachers' reaction in the instructional units and also to collect personal data about the young farmers and teachers.

The testing instrument and questionnaires were designed to facilitate the testing of the hypotheses and achievement of the objectives of the study.

Administration of Instruments

Young adult farmers in all schools in the study were post-tested in order to determine if there was a significant difference in the level of understanding farm management principles between the experimental and control groups. The testing instrument and questionnaires were administered by the agriculture teacher immediately following the farm management instruction in each of the three groups. The post-tests and questionnaires were forwarded to the principal investigator upon their completion for evaluation.

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[20] Rolloff.

Treatment of Data

Treatment of data includes the compilation, evaluation and interpretation of data received from the teachers participating in this study. An analysis was made of the relationship of the three techniques of farm management instruction and the post-test questions associated with the three instructional units.

Statistical analysis is presented depicting the relationship of sixteen independent variables as influencing young adult farmer understanding of farm management principles.

Compilation of Data

The answer sheets of the post-test, personal data questionnaires and instructional unit evaluations from the young adult farmers and teachers were forwarded to Cornell for processing upon their completion. The post-tests were graded and these results plus information concerning the young adult farmers and their teachers were placed on coding sheets as it was gathered. The coded data and post-test responses were then transferred to IBM cards. Data on the IBM cards were processed through the Electronic Computer 360 at the Cornell Computing Center. Data on the coding sheets pertaining to the independent variables were provessed on the Wang 360 Electronic Calculator in the Cornell Department of Education.

Evaluation and Interpretation of Data

The evaluation and interpretation of data is germane to the objectives of the study.

First Objective - The first objective was to develop the instructional units. The accomplishment of this objective was described in the beginning of this chapter.

Second Objective - The second objective of the study was to determine which of three instructional approaches resulted in the greatest level of young adult farmer understanding of farm management principles. To achieve this objective a post-test was administered to young adult farmers upon the completion of the farm management instruction in the experimental and control schools. The results received from this test were compiled and subjected to the analysis of variance by the F test to determine the significance of difference among and between each of the three groups using the various techniques of farm management instruction.

Hypotheses 1 and 2 established in Chapter I were formulated for testing in order to measure the achievement of this objective. These hypotheses are summarized in Figures 1 and 2. Campbell's experimental design for the post-test only group control design[21] is also illustrated in Figure 1.

Third Objective - The third objective of the study was to determine the relationship between the dependent variable of young adult farmer understanding of farm management principles and the following independent variables:

1. Young adult farmer's age
2. Years of managerial responsibility
3. Status - owner, part-owner, tenant, partner, hired hand,

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[21] Donald T. Campbell and Julian C. Stanley, "Experimental and Quasi-Experimental Designs for Research on Teaching," Handbook of Research on Teaching, N.S. Gage, ed. (Chicago: Rand McNally, 1963), p. 195.

Figure 1

Campbell's Experimental Design Posttest Only Group Control Design	Summary of Hypotheses
R X_A O_1	H_{1a} $\overline{X}_A > \overline{X}_C$
R X_B O_2	H_{1b} $\overline{X}_B > \overline{X}_C$
R O_3	H_2 $\overline{X}_A > \overline{X}_B$

Hypothesis 1.

Young adult farmers who receive farm management instruction by the farm management principle approach that is utilized in the developed instructional units will have a greater level of understanding farm management principles than those who are instructed in the usual farm management manner. This hypothesis can also be expressed as: H_{1a} $\overline{X}_A > \overline{X}_C$ and H_{1b} $\overline{X}_B > \overline{X}_C$.

Experimental Units	What Constituted Success?	What Comparison was Made?	What Test was Used?	Ground Rules for Interpretation
Groups of students receiving farm management instruction by different instructional approaches.	Mean posttest scores of the experimental and control groups on the level of understanding farm management principles.	$\overline{X}_A$ $\overline{X}_C$ $\overline{X}_B$ $\overline{X}_C$	Analysis of variance by the F test.	The developed units were considered the best approach used in this study if the tests revealed that young adult farmers in X_A and X_B had a significantly higher score than those in X_C.

Figure 2

Hypothesis 2.

Young adult farmers who receive the farm management principle approach to farm management instruction from teachers who received prior instruction on the use of the developed instructional units, X_A, will have a greater understanding of farm management principles than those who received instruction from teachers who had not received prior instruction on the use of the developed instructional units, X_B. This can also be expressed as: $H_2 \quad \overline{X}_A > \overline{X}_B$.

Experimental Units	What Constituted Success?	What Comparison was Made?	What Test was Used?	Ground Rules for Interpretation
Groups of students receiving farm management instruction by different instructional approaches.	Mean posttest scores of the experimental and control groups on the level of understanding farm management principles.	X_A X_B	Analysis of variance by the F test.	The instruction on the use of the developed units given to the teachers in X_A was considered significant if the young adult farmers in X_A had a significantly higher test score than those in X_B.

Hypothesis 3.

There will be a relationship between the independent variables and the level of understanding farm management principles.

Experimental Units	What Constituted Success?	What Comparison was Made?	What Test was Used?	Ground Rules for Interpretation
Groups of students receiving farm management instruction by different instructional approaches.	Mean posttest scores of the experimental and control groups on the level of understanding farm management principles.	The effect of each independent variable on the test scores of young adult farmers in all schools.	Analysis of variance by the F test.	A variable was considered as having an effect on the level of understanding farm management principles at the 5% level of significance.

working at home

4. Size of business - work units
5. Marital status
6. Formal education
7. Years enrolled in vocational agriculture
8. Part-time or full-time farmer
9. Interest in self-improvement - number of farm magazines read, farm radio programs he listens to and farm television programs he watches
10. Number of farm management meetings attended in current course
11. Length of instruction time
12. Length of time between first instructional unit and post-test
13. Age of teacher
14. Years of teaching vocational agriculture
15. Single or multiple teacher department
16. Advanced degree (teacher - yes or no)

All independent variables and mean post-test scores were subjected to the analysis of variance by the F test to determine relationship between the independent and dependent variables. In cases where a significant relationship was found, the subsets of the independent variables were again subjected to the analysis of variance by the F test to determine more precisely the area of significant difference.

Hypothesis 3 was formulated for testing in order to facilitate the achievement of this objective. This hypothesis is summarized in Figure 2.

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Fourth Objective - the fourth objective of the study was to conduct a teacher appraisal of the developed instructional units. The teachers' opinion of the instructional units was considered a valuable criterion for measuring their effectiveness. It is useless to develop effective teaching aids if teachers disapprove of them and as a consequence refuse to utilize them. Teachers in both experimental groups were asked to criticize the design, approach and content in order to appraise their worthiness for further use and development.

Teacher appraisal of the instructional units was secured by (1) an evaluation meeting with all the teachers in the two experimental groups, and (2) the use of a unit evaluation questionnaire. A copy of the Teacher's Reaction to Farm Management Instructional Units is enclosed in Appendix D.

Fifth Objective - The fifth objective of the study was to conduct a young adult farmer appraisal of the developed instructional units. The reaction to the instructional units by the students, average age 28.5, was considered a valuable evaluative measure of the units' effectiveness. "In the eyes of the practitioner, no other evidence outweighs student reaction as a measure of success of an instructional innovation."[22] Their reaction and criticism was recorded on a questionnaire that was administered upon the completion of the units. The evaluation instrument, "Young Farmers' Reaction to Farm Management Instructional Units," is enclosed in Appendix D.

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[22] Brickell, op. cit.

CHAPTER III

DATA ANALYSIS

The statistical analysis of the data obtained in the pursuit of measuring the effectiveness of the prepared farm management instructional units is presented in this chapter. Treatment of data includes a comparison of mean post-test scores with the three instructional treatments. An analysis is also made of the relationship of sixteen independent variables with young adult farmer understanding of farm management principles.

The results of the teacher and young adult farmer evaluation of the instructional units are also presented in this chapter.

Comparison of Instructional Treatments

It should be noted that the investigation procedures outlined in Chapter II and analysis of data to be presented contribute to the objectives of this study formulated in Chapter I.

The first objective was to develop the farm management instructional units. The accomplishment of this objective was described in the beginning of Chapter II.

The second objective of the study was to determine which of the three instructional approaches resulted in the greatest level of young adult farmer understanding of farm management principles. In order to achieve this objective, farm management exam mean post-test scores were compiled for each of the three instructional treatment groups; i.e. Experimental A, Experimental B and Control C. These data were then subjected to the analysis of variance of the F test to determine if there was a significant difference among the instructional techniques as measured by the mean post-test scores.

There were 178 post-tests returned from the teachers, 69 in the Experimental Group A, 36 in Experimental Group B and 73 in Control Group C. This number was reduced to 147 valid responses as some of the young adult farmers in the experimental groups did not attend all of the appropriate farm management meetings. The farm management principles were discussed in the second and third of the three farm management meetings, therefore, a response was considered valid if the young adult farmer had attended these two meetings. All of the responses in the control group were considered valid. The 147 valid responses included 48 in Experimental Group A, 26 in Experimental Group B and 73 in Control Group C.

Table 1 shows the farm management exam mean post-test scores according to the instructional treatment. Mean post-test scores ranged from a high of 27 correct responses out of 39 by the Experimental Group A to a low of 24.6 correct responses by the Control Group C. Experimental Group B had a mean score of 25. The standard deviation for Experimental Group A was 4.2, Experimental Group B, 5.9, and Control Group C, 5.7.

Each instructional treatment group was compared with each of the others, i.e. A versus C, A versus B and B versus C. A significant difference was noted between Experimental Group A and Control Group C as an F value of 5.38 was derived. This value was interpreted as being significant at the .05 level since the critical value needed at this point of confidence was 3.92.

It was noted that Experimental Group A scored higher than Experimental Group B, 27 - 25, but it was not a significant difference.

TABLE 1

Farm Management Exam Mean Post-Test Scores According to Instructional Treatment

Group	N	Post-Test Score	Standard Deviation
Experimental A	48	27	4.2
Control C	73	24.6	5.7
F Value = 5.38 - Significant at .05 level			
Experimental B	26	25	5.6
Control C	73	24.6	5.7
F Value = .09 - No significant difference			
Experimental A	48	27	4.2
Experimental B	26	25	5.6
F Value = 2.79 - No significant difference			

Experimental Group B scored slightly higher than Control Group C, 25 - 24.6 respectively, also not a significant difference.

Summary of Second Objective - The second objective of this study was to determine which of three instructional approaches results in the greatest level of young adult farmer understanding of farm management principles. This objective was achieved by comparing groups of young adult farmers who received farm management instruction by one of the three different instructional approaches.

Results of the total post-test measuring the understanding of farm management principles proved beyond the .05 level of confidence that young adult farmers who received the farm management principle approach to farm management instruction from teachers who received prior instruction on the use of the developed instructional units, Experimental Group A, have a greater understanding of farm management principles than those who were instructed in the usual farm management manner, Control Group C. The mean post-test score of Experimental Group A, 27, was significantly higher than Control Group C, 24.6. Therefore, hypothesis H_{1a} $\overline{X}_A > \overline{X}_C$ was accepted.

While accepting this hypothesis, the researcher is aware of the fact that even though the difference between the two mean scores was significant at the .05 level, this difference was quite small.

A second limiting factor relevant to this study is the fact that there were no norms in New York State with which a comparison of scores could be made. The absence of such norms limits the implications of the results of this study.

Results of the total post-test measuring the understanding of farm management principles, however, did not prove, beyond the .05

level of confidence that young adult farmers who received the farm management principle approach to farm management instruction from teachers who had _not_ received prior instruction on the use of the developed instructional units, Experimental Group B, have a greater understanding of farm management principles than those who were instructed in the usual farm management manner, Control Group C. The mean post-test score of Experimental group B, 25, was not significantly higher than Control Group C, 24.6. Therefore, hypothesis H_{1b} $\overline{X}_B > \overline{X}_C$ was rejected.

Results of the total post-test measuring the understanding of farm management principles did _not_ prove beyond the .05 level of confidence that young adult farmers who received the farm management principle approach to farm management instruction from teachers who had received prior instruction on the use of the developed instructional units, Experimental Group A, have a greater understanding of farm management principles than those who received the farm management principle approach to farm management instruction from teachers who had _not_ received prior instruction on the use of the developed instructional units, Experimental Group B. The mean post-test score of Experimental Group A, 27, was not significantly higher than Experimental Group B, 25. Therefore, hypothesis H_2 $\overline{X}_A > \overline{X}_B$ was rejected.

While rejecting this hypothesis, the researcher is aware of the need for in-service training when introducing new instructional techniques.

It is concluded that the prepared instructional units, when presented by teachers who had received prior instruction on their use, did improve young adult farmer understanding of farm management principles beyond the traditional technique of teaching farm management used by the control schools.

It is also concluded that the prior instruction that Experimental Group A teachers received was effective but not at a significant level when compared with the results of teachers who had not received the prior instruction.

Relationship Between Mean Post-Test Scores and Independent Variables

The third objective of the study was to measure the relationship between the young adult farmer level of understanding farm management principles and sixteen independent variables. To achieve this objective, the variables were first subjected to the analysis of variance by the F test to give an overall indication of their influence upon the total post-test score. If a significant difference at the .05 level was determined, the F test was repeated to determine the precise area of difference.

There were two groups of independent variables, those attributed to the teacher and those attributed to the young adult farmer. Each independent variable was examined first for its relationship with the mean score of all groups of young adult farmers and second with its relationship with each instructional treatment group. The N for the experimental groups did not always attain the totals of 48 for Experimental Group A and 26 for Experimental Group B due to incomplete responses.

Young Adult Farmer's Age - The ages of young adult farmers enrolled in all farm management classes ranged from a low of 17 to a high of 55. The mean age of the 147 respondents was 28.5.

Table 2 indicates there was no significant difference between the mean post-test scores achieved by all the young adult farmers within the six age groups. A distinct trend was revealed, however, that indicated that the older young adult farmers had a better grasp of farm management principles than the younger ones.

TABLE 2

Farm Management Exam Mean Post-Test Scores
According to Age of Young Adult Farmers

Age Groups		Treatment Groups			
		A	B	C	All Groups
Under 21	N	10	3	11	24
	Mean Score	26.3	25.6	20.8	23.7
	S.D.	4.3	3.8	5.1	5.2
21 - 25	N	14	7	20	41
	Mean Score	27.4	26.1	22.9	24.9
	S.D.	3.3	7.9	5.6	5.7
26 - 30	N	11	8	10	29
	Mean Score	27.8	23.2	24.9	25.5
	S.D.	4	5.6	4.8	5
31 - 35	N	7	3	9	19
	Mean Score	24.6	23.7	23.9	24.1
	S.D.	3.9	3.2	5.9	4.7
36 - 40	N	4	2	11	17
	Mean Score	30	22	28.8	28.3
	S.D.	6.9	11.3	5	6.2

TABLE 2 (continued)

Over 41	N	2	3	10	15
	Mean Score	24.5	27	28.2	27.5
	S.D.	4.9	3.5	4.4	4.2
F Value		2.24	.36	4.01*	1.21

*Significant at .01 level.

There was a significant relationship between age and the mean post-test scores of the young adult farmers in the control group with a similar trend revealing that the older respondents did better than the younger respondents. This significant difference was proved beyond the .01 level of confidence. A further examination of the data by the F test revealed that the precise area of difference was between young adult farmers younger than 25 years and older than 36.

It can be concluded, therefore, that there is a relationship between age of the young adult farmer and his understanding of farm management principles. This relationship, however, is not at a significant level. This relationship is probably due to the fact that older young adult farmers have had an opportunity for more experience in decision making.

Years of Managerial Responsibility - The young farmers varied considerably in the length of time they had been responsible for making managerial decisions. Their years of managerial responsibility ranged from a low of less than a year to 27 years with an average of 7.5 years.

Table 3 indicates a slight relationship (not at a significant level) between all groups of young adult farmers' years of managerial

TABLE 3

Farm Management Exam Mean Post-Test Scores According to Years of Managerial Responsibility

Year		Treatment Groups A	B	C	All Groups
0 - 5	N	23	11	28	62
	Mean Score	26	26.1	22.8	24.6
	S.D.	3.7	5.4	5.5	5.1
6 - 10	N	16	7	14	37
	Mean Score	27.6	21.7	26.1	25.9
	S.D.	4.1	6.4	5.2	5.3
11 - 15	N	3	2	7	12
	Mean Score	28.3	27.5	25.7	26.7
	S.D.	7.4	10.6	5.8	6.3
Over 15	N	4	5	14	23
	Mean Score	28.2	24.4	27.9	27.2
	S.D.	5.2	6.4	5.5	5.6
F Value		.72	.85	2.96*	1.59

*Significant at .05 level.

responsibility and their mean post-test scores. The major difference in scores was between the 5 years and less group, 24.6, and the 15 years and over group, 27.2. The two groups in between had very similar scores, 25.9 - 26.7.

This variable did, however, have a significant affect on the young adult farmers in the control group. The same trend as with all groups was revealed as the major difference in the understanding of farm management principles was found in the two extreme groups with the middle two groups having similar scores, 26.1 and 25.7.

This variable had very little affect on the young adult farmers in the experimental groups. This could be an indication that years of managerial responsibility had little affect on young farmers' ability to improve their understanding of farm management principles when their instruction was based on the prepared farm management instructional units.

It is concluded that years of managerial responsibility generally has some affect on young adult farmers' ability to understand farm management principles.

Management Status - The management status of the young adult farmers had a distinct influence on their understanding of farm management principles. Tables 4 and 5 indicate that the owners, part-owners, partners and tenants scored significantly higher, at the .01 level, than the hired hands and those who worked at home. An analysis of the treatment groups indicated that the management status had a similar influence on the control group but to a lesser extent on the experimental groups.

TABLE 4

Farm Management Exam Mean Post-Test Scores
According to Management Status

		Treatment Groups			
		A	B	C	All Groups
Owner	N	24	8	32	64
	Mean Score	26.6	22.7	27.3	26.4
	S.D.	3.8	6.5	5.5	5.3

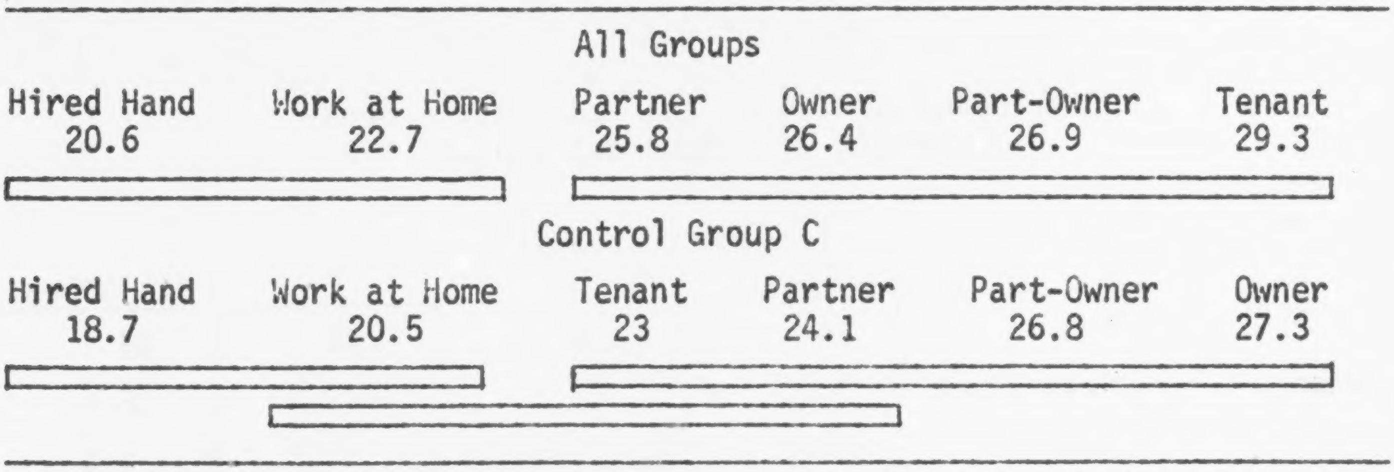
TABLE 4 (continued)

Part-Owner	N	12	4	6	22
	Mean Score	28	23.3	26.8	26.9
	S.D.	4.7	2.4	3.8	4.3
Tenant	N	1	1	1	3
	Mean Score	36	29	23	29.3
	S.D.	0	0	0	6.5
Partner	N	3	6	10	19
	Mean Score	24.3	29.3	24.1	25.8
	S.D.	2.1	6.3	3.8	4.9
Hired Hand	N	1	3	7	11
	Mean Score	31	21.7	18.7	20.6
	S.D.	0	6	3.9	5.5
Work at Home	N	7	4	13	24
	Mean Score	25.7	24.5	20.5	22.7
	S.D.	4.2	3.9	4.8	4.9
F Value		1.79	2.53	6.06*	4.53*

*Significant at .01 level.

TABLE 5

Homogeneous Subsets of Mean Post-Test Scores According to Managerial Status*



All Groups

Hired Hand	Work at Home	Partner	Owner	Part-Owner	Tenant
20.6	22.7	25.8	26.4	26.9	29.3

Control Group C

Hired Hand	Work at Home	Tenant	Partner	Part-Owner	Owner
18.7	20.5	23	24.1	26.8	27.3

*Mean post-test scores with a common bar were found not to be significantly different according to the F test.

A further statistical check revealed a significant difference between the average age of the owners, part-owner, partners, tenants, 30.5 years, and the hired hands and those who worked at home, 22.7 years.

It can be concluded, therefore, that young adult farmers who had greater responsibility for making managerial decisions also had a greater understanding of farm management principles. This difference is probably due to their increased age as well as their additional experience in making managerial decisions.

Size of Business - The size of the young adult farmers' farm business was measured in work units. The average size farm business for the 147 respondents was 658 work units. Table 6 indicates that the size of farm business did not have a significant influence on the young adult farmer understanding of farm management principles as measured by the mean post-test scores.

TABLE 6

Farm Management Exam Mean Post-Test Scores According to Size of Farm Business

Work Units		Treatment Groups			
		A	B	C	All Groups
Under 100 W.U.	N	1	0	2	3
	Mean Score	26	0	23.5	24.3
	S.D.	0	0	6.4	4.7
100-299 W.U.	N	1	4	5	10
	Mean Score	28	23.8	25.2	24.9
	S.D.	0	4.5	7.9	6

Table 6 (continued)

300-499 W.U.	N	17	3	15	35
	Mean Score	27	22	26.3	26.3
	S.D.	4	1.7	5.4	4.6
500-699 W.U.	N	16	3	26	45
	Mean Score	26	23.7	23.1	24.2
	S.D.	4.9	10	6.1	5.9
700-899 W.U.	N	3	2	4	9
	Mean Score	26.3	23	28.3	26.4
	S.D.	5	2.8	4	4.2
900-1099 W.U.	N	2	1	6	9
	Mean Score	30	25	28	28.1
	S.D.	2.8	0	2.5	2.7
1100-1299 W.U.	N	3	1	3	7
	Mean Score	24	33	29	23.1
	S.D.	1	0	2.6	5.3
Over 1300 W.U.	N	4	3	4	11
	Mean Score	30.5	25.3	27.5	28
	S.D.	3.1	9.3	3.1	5.3
F Value*		.87	.38	1.63	1.46

*No significant difference

Marital Status - There were 97 married young adult farmers in the study compared with 47 who were single. Table 7 indicates that marriage had an influence on the young adult farmer understanding of farm management principles but not at a significant level for all groups. The marriage influence, however, was significant at the .01 level for young adult farmers in the control group.

TABLE 7

Farm Management Exam Mean Post-Test Scores of
Single and Married Young Adult Farmers

		Treatment Groups A	B	C	All Groups
Single	N	17	6	24	47
	Mean Score	27	23.2	21.9	24.2
	S.D.	4.7	4.6	5.7	5.9
Married	N	30	20	47	97
	Mean Score	26.4	25	25.9	25.9
	S.D.	3.9	6.2	5.3	5.1
F Value		1.39	.47	8.59*	2.97

*Significant at .01 level

A further check of the data reveals that the married young adult farmers were older, average age 31.7 years, than their unmarried counterparts, average age 22.2 years.

It can be concluded that marital status, in addition to age, has an influence on young farmer understanding of farm management principles when the traditional techniques of farm management instruction are used.

Years of Formal Education - Fifteen percent of the young adult farmers had less than a high school education. Sixty-five percent had completed high school and an additional 20 percent had taken at least two years of post high school training. Four of the respondents had completed their baccalaureate degree and 18 had two year degrees from Agricultural and Technical Colleges. Tables 8 and 9 indicate that the number of years of formal education had a distinct influence on young adult farmer understanding of farm management principles. A significant difference at the .05 level was revealed in all groups

TABLE 8

Farm Management Exam Mean Post-Test Scores According to Years of Formal Education

		Treatment Groups			
		A	B	C	All Groups
Less Than 12 Years	N	7	7	7	21
	Mean Score	24.6	23	23.1	23.6
	S.D.	4.2	4.8	4.1	4.2
12 Years	N	34	14	47	95
	Mean Score	27.3	25.5	23.5	25.2
	S.D.	4.4	5.2	5.9	5.5
More Than 12 Years	N	7	5	17	29
	Mean Score	27.4	25.2	28.4	27.6
	S.D.	2.8	9.5	4.4	5.2
F Value		1.34	.41	5.38**	3.88*

*Significant at .05 level

**Significant at .01 level

TABLE 9

Subsets of Mean Post-Test Scores According to Years of Formal Education*

	Less Than 12 Years	12 Years	More Than 12 Years
All Groups	23.6	25.2	27.6
Control Group C	23.1	23.5	28.4

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*The mean post-test scores with a common bar were found not to be significantly different according to the F test.

between those who had graduated from high school and those who had received training beyond high school. The advantage attributed to post-high school training was even more pronounced in the control group as it was significant beyond the .01 level of confidence.

It is concluded that additional formal education increased young adult farmer understanding of farm management principles. This is especially true for students who receive traditional farm management instruction.

Years Enrolled in Vo-Ag - Eighty-one of the respondents in this study completed the four year high school vocational agriculture course. Eight completed three years, 14 completed two years, 8 completed one year and 22 had no high school vocational agriculture instruction.

An analysis of the statistical data revealed that vocational agriculture instruction had no influence on the young adult farmer understanding of farm management principles. It can be concluded, from the data in Table 10, that a background in vocational agriculture did not improve the young adult farmers' understanding of farm management principles.

TABLE 10

Farm Management Exam Mean Post-Test Scores According to Years Enrolled in Vocational Agriculture

		Treatment Groups			
		A	B	C	All Groups
No Vo-Ag	N	10	3	9	22
	Mean Score	24.1	25	29.3	26.4
	S.D.	3.3	4.6	3.6	4.3
1 Year	N	2	0	6	8
	Mean Score	27.5	0	23.8	24.8
	S.D.	2.1	0	6.5	5.8

TABLE 10 (continued)

2 Years	N	2	6	6	14
	Mean Score	27.5	23.8	25.5	25.1
	S.D.	9.2	6.6	4.9	5.9
3 Years	N	1	3	4	8
	Mean Score	32	26.3	27.3	27.5
	S.D.	0	7.8	6.2	6.1
4 Years	N	27	12	42	81
	Mean Score	27.9	24.3	23.7	25.2
	S.D.	3.8	5.6	5.8	5.5
F Values*		2.15	.13	2.14	.54

*No significant difference

Full and Part-Time Farming - The vast majority of the young adult farmers in this study were farming on a full-time basis. Table 11 indicates that 128 were full-time farmers and 17 were part-time farmers. Table 11 also reveals that farming on a full or part-time basis had no influence on the young adult farmer understanding of farm management principles.

TABLE 11

Farm Management Exam Mean Post-Test Scores
of Full and Part-Time Young Adult
Farmers

		Treatment Groups			
		A	B	C	All Groups
Full-Time	N	43	18	67	128
	Mean Score	27	24.9	24.5	25.4
	S.D.	4.4	6.8	5.6	5.5

TABLE 11 (continued)

Part-Time	N	5	7	5	17
	Mean Score	26	24	27.6	25.7
	S.D.	1.9	3.9	6.9	4.6
F Value*		.29	.07	1.36	.04

*No significant difference

Interest in Self-Improvement - The young adult farmers' interest in improving their farm management ability was measured by the total number of farm magazines they read regularly, farm radio programs they listened to in a week, and farm television programs they watched in a week. The total number of farm news media that respondents came in contact with ranged from a low of 1 to a high of 22 with 5.2 as the average.

Table 12 indicates that the number of farm news media that the respondents came in contact with had no influence on young adult farmer understanding of farm management principles.

TABLE 12

Farm Management Exam Mean Post-Test Scores According to Contact with News Media - Farm Magazines, Weekly Farm Radio and TV Programs

Number of Media		Treatment Groups A	B	C	All Groups
Under 3	N	7	3	7	17
	Mean Score	25.4	29	22.9	25
	S.D.	5.2	4	3.7	4.7
3 - 4	N	19	10	18	47
	Mean Score	26.5	23.9	23.1	24.6
	S.D.	3.5	6.9	5.1	5.1

TABLE 12 (continued)

5 - 6	N	13	10	20	43
	Mean Score	27.6	24.3	26.7	26.4
	S.D.	4.7	5.9	5.4	5.3
Over 6	N	8	3	26	37
	Mean Score	27.9	22	24.2	24.8
	S.D.	4.4	2.6	6.5	6.1
F Value*		.60	.78	1.55	.97

*No significant difference

Farm Management Meetings Attended - Young adult farmers in the experimental groups were asked to indicate on their questionnaires which farm management meetings they attended. The respondents in the experimental groups attended an average of 2.5 meetings out of the three farm management meetings.

The relationship of family and production goals was discussed at the first meeting and farm management principles were discussed at the second and third meetings. Table 13 indicates that attendance at the second and third meetings had a distinct influence on the young adult farmer understanding of farm management principles. The mean post-test score of the respondents who attended all three or the second and third meetings was 26.2 compared with 19 for the respondents who did not attend both the second and third meetings.

It is concluded that the instruction pertaining to farm management principles definitely enhanced the young adult farmer understanding of farm management principles.

TABLE 13

Farm Management Exam Mean Post-Test Scores According to Number of Farm Management Meetings Attended

Meetings Attended		Treatment Groups		
		A	B	A and B
First Only	N	3	0	3
	Mean Score	15	0	15
	S.D.	8	0	8
Second Only	N	1	0	1
	Mean Score	29	0	29
	S.D.	0	0	0
Third Only	N	3	1	4
	Mean Score	16.3	30	19.8
	S.D.	7.6	0	9.2
All Three	N	40	22	62
	Mean Score	26.5	24.9	25.9
	S.D.	4.2	5.1	4.6
First & Second	N	4	4	8
	Mean Score	18.3	14.8	16.5
	S.D.	4	5.1	4.7
First & Third	N	6	4	10
	Mean Score	17.7	26	21
	S.D.	6.3	7.4	7.7
Second & Third	N	9	4	13
	Mean Score	28.6	26	27.8
	S.D.	4.3	8.5	5.7
F Value		9.17**	3.15*	7.35**

*Significant at .05 level

**Significant at .01 level

Length of Instruction Time - Teachers in the experimental groups were asked to record the length of instructional time for the second and third farm management instructional units. The farm management principles were discussed at these two meetings. The average length of instructional time for these two meetings was 210 minutes. The minimum length of time spent was 120 mintues and the maximum was 390 minutes.

Table 14 reveals that the length of instructional time had no influence on the young farmer understanding of farm management principles.

TABLE 14

Farm Management Exam Mean Post-Test Scores According to Length of Instruction Time

		Treatment Groups		
Minutes		A	B	Both Groups
	N	8	8	16
120 - 160	Mean Score	25.6	26.6	26.1
	S.D.	4.7	4.7	4.6
	N	21	4	25
180 - 190	Mean Score	27.3	23.5	26.7
	S.D.	4.2	7.3	4.8
	N	13	6	19
200 - 210	Mean Score	26.3	25.7	26.1
	S.D.	4.1	7.4	5.2
	N	6	8	14
Over 240	Mean Score	29	22.7	25.2
	S.D.	3.9	5.3	5.6
F Values*		.88	.74	.27

*No significant difference

It is concluded that some of the teachers could effectively teach farm management principles in a minimum amount of time.

Length of Time Between First Instructional Unit and Post-Test - Teachers in the experimental groups were asked to record the number of days between the first of the three farm management instructional units and the day they administered the post-test. The post-test was administered at the conclusion of the third instructional meeting. The average length of time between the first unit and the post-test was 37 days. The lowest number of days was 7 and the highest was 90.

Table 15 indicates that the length of time between the first instructional unit and the post-test had no influence on the young adult farmer understanding of farm management principles as measured by a post-test.

TABLE 15

Farm Management Exam Mean Post-Test Scores According to Number of Days Between First Instructional Unit and Post-Test

Days		Treatment Groups A	B	Both Groups
7 - 15	N	24	4	28
	Mean Score	27.1	27.8	27.2
	S.D.	4.3	6.7	4.5
30 - 36	N	13	10	23
	Mean Score	26.1	27.8	24.7
	S.D.	3.6	2.9	3.6
56 - 67	N	7	12	19
	Mean Score	25.9	25.1	25.4
	S.D.	5.1	7.1	6.3

TABLE 15 (continued)

90	N	4	0	4
	Mean Score	31	0	31
	S.D.	2.5	0	2.5
F Value*		1.65	1.1	2.73

*No significant difference

Age of Teacher - The average age of teachers who participated in this study was 39.4 years. The youngest was 23 and the oldest was 55.

Table 16 indicates that the age of the teacher had no influence on the effectiveness of their teaching as measured by the young adult farmer understanding of farm management principles. An analysis of the data revealed a significant difference among the respondents in the control group but this difference was not in a consistent direction as the post-test scores were 25.8 in the under 30 group, 18.2 in the 30-39 group, 26.3 in the 40-49 group and 24.7 in the 50-57 group.

TABLE 16

Farm Management Exam Mean Post-Test Scores of Young Adult Farmers According to Age of Teachers

		Treatment Groups			
		A	B	C	All Groups
Under 30	N	25	14	5	44
	Mean Score	26.6	23.9	25.8	25.6
	S.D.	4.3	6.2	7.5	5.4
30 - 39	N	7	8	6	21
	Mean Score	25.9	26.6	18.2	23.9
	S.D.	5.1	4.7	1.8	5.5

2

TABLE 16 (continued)

40 - 49	N	14	4	19	37
	Mean Score	28.2	23.5	26.3	26.7
	S.D.	4.1	7.3	4.4	4.7
50 - 55	N	2	0	43	45
	Mean Score	25	0	24.7	24.7
	S.D.	2.8	0	5.9	5.8
F Value		.73	.65	3.52*	1.57

*Significant at .05 level

It is concluded that the age of the teacher had no bearing on the effectiveness of their farm management instruction.

Years of Teaching Experience - The teachers participating in this study had taught vocational agriculture an average of 14 years with a range of 2 to 29 years.

Table 17 indicates that the number of years the teacher had taught had no influence on their effectiveness when giving farm management instruction. There was a significant difference of mean post-test scores in the control group, however, this difference was not in a consistent direction.

TABLE 17

Farm Management Exam Mean Post-Test Scores of Young Adult Farmers According to Teachers' Years of Teaching Experience

		Treatment Groups			
Years		A	B	C	All Groups
1 - 7	N	32	18	14	64
	Mean Score	26.5	24.2	26.9	25.9
	S.D.	4.3	5.5	6.1	5.1

TABLE 17 (continued)

8 - 14	N	0	4	6	10
	Mean Score	0	27.8	18.2	22
	S.D.	0	6.7	1.8	6.4
15 - 21	N	7	4	0	11
	Mean Score	26.7	23.5	0	25.5
	S.D.	2.7	7.3	0	4.8
22 - 29	N	9	0	53	62
	Mean Score	28.7	0	24.8	25.4
	S.D.	4.8	0	5.4	5.5
F Value		.92	.67	5.6*	1.56

*Significant at .01 level

It is concluded that length of teaching experience did not improve the teachers ability to teach farm management.

Single or Multiple Teacher Departments - Fifteen of the participating schools had single teacher agriculture departments. Three schools had two agriculture teachers and three schools had three agriculture teachers. Teachers in single teacher departments taught secondary students as well as young adult farmers while teachers in multiple teacher departments generally had more time to spend on young adult farmer instruction.

Table 18 indicates that the number of teachers in the agriculture department had no influence on the young adult farmer understanding of farm management principles as measured by the post-test scores.

TABLE 18

Farm Management Exam Mean Post-Test Scores of Young Adult Farmers According to Number of Vo-Ag Teachers in Local Department

Number of Teachers		Treatment Groups A	B	C	All Groups
	N	27	19	51	97
1	Mean Score	27.7	24.3	25.2	25.7
	S.D.	4.1	6.1	6.1	5.7
	N	0	7	10	17
2	Mean Score	0	25.7	25.3	25.5
	S.D.	0	5.3	2.8	3.9
	N	21	0	12	33
3	Mean Score	26	0	21.5	24.4
	S.D.	4.2	0	5	4.9
F Value*		1.78	.32	2.17	.71

*No significant difference

It is concluded that farm management instruction presented by teachers in single teacher departments was as effective as farm management instruction presented by teachers in multiple teacher departments.

Teachers' Advanced Degree - Fifteen of the teachers participating in this study had completed a baccalaureate degree and six had received a master's degree.

An analysis of the data as revealed in Table 19 indicates that the advanced degree did not improve their effectiveness of farm management instruction. On the contrary, farm management instruction from teachers without the advanced degree was the most effective as measured by the young adult farmer understanding of farm management principles.

TABLE 19

Farm Management Exam Mean Post-Test Scores of Young Adult Farmers According to Teachers' Advanced Degree

		Treatment Groups			
		A	B	C	All Groups
Master's Degree	N	7	10	24	41
	Mean Score	25.9	22	23.7	23.7
	S.D.	5	4.6	6.3	5.7
Bachelor of Science	N	41	16	49	106
	Mean Score	27.2	26.2	25.1	26.1
	S.D.	4.1	6.1	5.4	5.1
F Value		.56	3.51	.95	6.1*

*Significant at .01 level

It is concluded that attainment of an advanced degree did not improve the teachers' effectiveness when teaching farm management.

Summary of Third Objective - The third objective of this study was to measure the relationship between the young adult farmer level of understanding farm management principles and sixteen independent variables. This objective was achieved by subjecting the independent variables to the analysis of variance by the F test to determine their influence on young adult farmer understanding of farm management principles as measured by a post-test.

Four of the independent variables influenced all groups of young adult farmer understanding of farm management principles to a significant degree. These four were:

1. The managerial status of the young adult farmer - owner, part-owner, partner, tenant, hired hand and work at home.
2. The extent of the young adult farmer's formal education.
3. The number of farm management meetings attended by respondents in the experimental groups.
4. Whether the teacher had earned an advanced degree or not. This variable proved to have a negative influence.

Three of the independent variables had a minor influence on all young adult farmers. These were:

1. Age of the young adult farmer
2. The length of time the young adult farmer had been making managerial decisions.
3. Marital status of the young adult farmer

Nine of the variables had little, if any, influence on all of the young adult farmers' understanding of farm management principles. These were:

1. Size of farm business
2. Years enrolled in vocational agriculture
3. Full or part-time farmer
4. Interest in self-improvement
5. Length of instruction time
6. Time between first unit and post-test
7. Age of teacher
8. Years of teaching experience
9. Single or multiple teacher department

A further study of the data reveals that the independent variables had more influence on the total number of respondents and those in the control group than they did on the respondents in the experimental groups. Only two of the variables influenced young adult farmers in the experiemntal groups: formal education and the number of farm management meetings attended.

On the other hand, of the seven variables that had a minor or significant influence on all groups, four were significant at the .01 level and another at the .05 level in the control group.

Hypothesis number three stated that there will be a relationship between the independent variables and the level of understanding farm management principles as measured by McCormick's post-test instrument. Since some of the variables did show a relationship, this hypothesis was accepted.

Teacher Evaluation of Instructional Units

The fourth objective of the study was to conduct a teacher appraisal of the developed instructional units. This objective was achieved by (1) conducting an evaluation meeting with all the teachers in the experimental groups, and (2) securing the teachers' reaction on a unit evaluation questionnaire.

An instructional evaluation meeting was conducted for teachers who had used the prepared units in their young adult farmer classes. These were the teachers in Experimental A and B Groups. The meeting was conducted April 19, 1969 at Cornell University. The principal investigator conducted the meeting with assistance from the following: Professor W. E. Drake, Project Director, Dr. W. H. Kelly and Dr. J. R. Crunkilton.

The teachers were requested to direct their attention to the following aspects of the instructional units:

1. Format
2. Examples used to illustrate the principles
3. The overhead projectuals used to illustrate the examples
4. The suggested discussion questions
5. The conclusions that were drawn from each farm management principle

The following is a summary of the suggestions that the teachers made to improve the farm management instructional units:

1. Expand the three units to six, one each on:
    a. relationship of goals to decision making
    b. diminishing returns principle
    c. fixed and variable cost relationship
    d. substitution principle
    e. opportunity costs principle
    f. profitable enterprise combinations
2. Add a terminology section to each topical outline.
3. Adjust the overhead projectuals so that they:
    a. are small enough to fit all projectors
    b. are brief and to the point
    c. include print that is easy to read
    d. are made of heavier acetate with no frame
4. Rewrite the objective for the first unit on goals to include a measurable outcome such as having each young adult farmer develop a list of family and production goals for his situation.
5. Emphasize a follow-up of the unit on goals by the young adult farmer and his teacher.
6. Expand the list of suggested goals.

7. Add "intermediate goals" to goals worksheet.
8. Include suggested "hand outs" for young adult farmers.
9. Emphasize soil analysis and use of records in order to relate the fertilizer example to the young adult farmer's own situation.
10. Add additional examples and overhead projectuals so that teachers may select appropriate ones to use.
11. Give more directions to the teacher on how to relate the examples to on-farm situations.
12. Relate new terms to their use in current farm publications.
13. Add an example that illustrates how young adult farmers can determine their inputs and outputs in order to make decisions.
14. Add to the format a suggested preparation for the teacher.
15. Use the same format with the unit on profitable enterprise combinations.
16. Keep emphasizing types of records that are necessary.
17. Relate terms with the examples immediately.

When the teachers in the experimental groups had finished using the instructional units, they were asked to complete the following questionnaire, "Teacher's Reaction to Farm Management Instructional Units."

The questionnaire was divided into two sections. In the first section they were asked for their reaction to nine aspects of the instructional units. They indicated their reaction on a four point scale, (1) very useful, (2) useful, (3) some value, and (4) little or no value. Table 20 is a summary of their reactions.

TABLE 20

Summary of Teachers' Reaction to the Instructional Units

Questions Asked Teachers	Answers	
What is your general reaction to:		
a. the approach used in the three units?	Very Useful	42%
	Useful	58%
b. the first unit on the relationship of goals to decision making?	Very Useful	33%
	Useful	33%
	Some Value	33%
c. the section in the second unit on the principle of diminishing returns?	Very Useful	58%
	Useful	42%
d. the section in the second unit on the fixed-variable cost relationship?	Very Useful	42%
	Useful	50%
	Some Value	8%
e. the section in the third unit on the principle of substitution?	Very Useful	25%
	Useful	75%
f. The section in the third unit on the principle of opportunity costs?	Very Useful	25%
	Useful	58%
	Some Value	17%
g. the section in the third unit on profitable enterprise combinations?	Useful	67%
	Some Value	33%
How useful were the examples that were used to illustrate the principles and concepts?	Very Useful	33%
	Useful	50%
	Some Value	17%
How useful were the overhead projectuals?	Very Useful	92%
	Useful	8%

In the second section of the questionnaire the teachers had an opportunity to express feelings about the examples and overhead projectuals that were used. They were also requested to list the two greatest weaknesses and strengths of the units and to suggest changes for improvement. The following are a few of the helpful suggestions made by the teachers on the questionnaires:

Pertaining to the examples

1. Include more examples that are pertinent to New York farming situations.
2. Improve the examples in the unit on goals.
3. Improve the example used to ullustrate the fixed-variable cost relationship.
4. Use silage instead of grain corn in the examples.

Pertaining to the overhead projectuals

1. Clarify #4 on relationship between changes and family goals.
2. Excessive data on #12, principle of substitution.

Weaknesses

1. Examples were not specific to New York conditions.
2. Over their heads until an example was repeated.
3. Need more examples and go deeper in some aspects.
4. Some terms are confusing.

Strengths

1. Simplicity - fairly fast moving.
2. Created good discussion and got members to thinking.
3. Good visual aids and examples to show principles.
4. Sequence building toward a climax.
5. Point about maximum returns for each investment.

6. Information forced students to analyze their own farm business.
7. Minimum amount of time required to prepare.
8. The principles got the students thinking about their farm operation as a business.

Changes Suggested

1. Add more practical examples.
2. Units 1 and 2 were short and 3 too long, make them more even.
3. Include reference material as background for examples.
4. Use outline form with less formal language.
5. Improve first unit on goals.
6. Have problems for young adult farmers to solve.

Other Comments

1. Actual experience situations would improve interest.
2. Students paid close attention especially when applying the principles to their own situation.
3. We need more units similar to these on various phases of farm operation.
4. This is what young adult farmers want and need.

Summary of Fourth Objective - The fourth objective of the study was to conduct a teacher appraisal of the instructional units. The teachers' reactions received from the unit evaluation meeting and the questionnaires were believed to be imperative for improving the units.

The teachers were quite enthusiastic about the units. They found them very useful and appreciated the fact that little preparation time was required to use them. They were critical of some aspects of the units and made many helpful suggestions to improve them. The most common criticism was directed toward some of the examples that were used to illustrate the farm management principles.

They enjoyed being involved in a project they considered useful to their profession. This was emphasized by one teacher as he remarked when he was leaving the evaluation meeting, "Today was time well spent. I would be happy to participate in more projects like this one."

It has been determined by the principal investigator that the evaluation meeting and teacher questionnaires were successful in their efforts to achieve the objective of obtaining the teachers' reaction to the instructional units.

Young Adult Farmer Evaluation of Instructional Units

The fifth objective of this study was to conduct a young adult farmer evaluation of the prepared instructional units. It was felt that their reaction could serve two purposes, (1) provide a measure of the effectiveness of the units, and (2) assist in the improvement of the units.

To achieve this objective, the young adult farmers in the experimental groups were asked to complete the following questionnaire at the close of the third and last farm management meeting, "Young Farmers Reaction to Farm Management Instructional Units." This questionnaire was similar to the teachers' questionnaire except that a five point scale was used to measure their reaction to various aspects of the units instead of four. This scale included: very useful, useful, some value, little value and no value. Table 21 is a summary of the first part of the questionnaire. The young adult farmers were asked not to respond to questions that pertained to meetings they did not attend.

TABLE 21

Young Adult Farmers' Reaction to Farm Management Instructional Units

Questions Asked Young Adult Farmers	Answers	
What is your reaction to:		
a. the series of three farm management meetings:	Very Useful	19%
	Useful	50%
	Some Value	28%
	Little Value	2%
	No Value	1%
b. the first unit on the relationship of goals to decision making?	Very Useful	21%
	Useful	46%
	Some Value	28%
	Little Value	3%
	No Value	2%
c. the second unit on diminishing returns principle and fixed-variable cost relationship?	Very Useful	26%
	Useful	54%
	Some Value	13%
	Little Value	7%
	No Value	0
d. The third unit on principles of substitution, opportunity costs and profitable enterprise relationships?	Very Useful	16%
	Useful	50%
	Some Value	27%
	Little Value	6%
	No Value	1%
How useful do you believe the examples were that were used to illustrate the principles and concepts?	Very Useful	20%
	Useful	40%
	Some Value	35%
	Little Value	5%
	No Value	0
How useful do you believe the overhead projectuals were?	Very Useful	30%
	Useful	45%
	Some Value	18%
	Little Value	6%
	No Value	1%

The young adult farmers were also asked to describe what they felt were the weaknesses and strengths of the units and also to suggest changes. The following is a summary of the comments made by the students:

Weaknesses

1. Not enough detail in some illustrations.
2. Some examples difficult to understand.
3. Too general and should include reference material.
4. Should go deeper into some units.
5. Should use real figures in examples.
6. Needed more time to complete the units.
7. Too long
8. Some terms were hard to understand
9. Farm management is a dry subject

Strengths

1. Main ideas, examples and overhead projectuals were good.
2. Helps to make the right farm management decisions.
3. Stimulated thought
4. Gives general idea of principles and concepts and how they apply to decisions.
5. Creates ability to plan and consider profits over production costs.
6. Money management and what machinery is the best investment.
7. Liked the unit on fixed-variable cost relationships.
8. Good iedas to put into practice.
9. Helped in decision making and analyzing farm business.
10. Helps young farmers to think before acting.

Changes

1. Use more realistic figures in the examples
2. More units and more time
3. Break units into 4 or 5 smaller ones
4. Have time for follow-up on students' problems
5. Use more complex examples
6. Give handouts to students
7. More explicit and understandable examples.

Comments

1. Topics handled very well
2. Very interesting units
3. Good units - very important

Summary of Fifth Objective - The young adult farmers' evaluation of the instructional units is considered valuable and pertinent information. Their reaction is useful for evaluating the units and can be used to improve the units.

They generally reacted very favorably toward the units. Table 21 indicates that the majority felt that all aspects of the units were either useful or very useful. The second unit on diminishing returns and fixed-variable cost relationships was considered the most helpful of all the units. The overhead projectuals were also considered more useful than the examples used.

The reaction was varied due to the differences among the young adult farmers themselves and also due to the teacher variability. Some felt that the units were too difficult while others thought the teacher should go deeper into the use of the principles. A common criticism was that more time should be allowed on the individual principles.

Several lauded the units for their practicality. Another common request was for examples that were more pertinent to their own situations.

The comment by one of the students that, "Farm management is a dry subject" is pertinent to one of the lesser benefits of the prepared instructional units. The principal investogator had intended that the instructional units be more interesting and palatable to young adult farmers than the traditional techniques of farm management instruction. The general response to the units indicates that this objective has been met.

The principal investigator considers the young adult farmer questionnaire as an effective way to acheive the objective of obtaining the students' reaction to the farm management instructional units.

CHAPTER IV

SUMMARY, CONCLUSIONS, IMPLICATIONS, AND RECOMMENDATIONS

Summary

The major purpose of this study was to develop and measure the effectiveness of instructional units which were designed to enable young adult farmers to improve their ability to use farm management principles when making decisions.

Need for the Study

New technology and rising production costs in American agriculture have forced agricultural educators to adjust their vocational training programs to meet the changing needs of their clientele. In this adjustment, a pressing need becomes apparent for effective farm management instructional units which vocational agriculture teachers can readily understand and use in their young adult farmer classes. As a means for fulfilling this need, a series of instructional units were developed emphasizing the farm management principle approach to farm management instruction. Basic management principles were stressed in the units assuming that if a farmer can learn to use farm management principles in the decision making process, he can use this approach with all management decisions.

New instructional units must be tried and evaluated before widespread use can be recommended. Therefore, 28 vocational agriculture teachers in New York State were asked to participate in this project.

Specific Objectives

The study was designed to achieve the following specific objectives:

1. To develop farm management principle instructional units which vocational agriculture teachers can use in their young adult farmer classes.
2. To determine which of three instructional approaches results in the greatest level of young adult farmer understanding of farm management principles.
3. To measure the relationship between the young adult farmer level of understanding farm management principles and the following independent variables:
    - a. Young adult farmer's age
    - b. Years of managerial responsibility
    - c. Status - owner, part-owner, tenant, partner, hired hand, working at home
    - d. Size of business - work units
    - e. Marital status
    - f. Formal education
    - g. Years enrolled in vocational agriculture
    - h. Part-time or full-time farmer
    - i. Interest in self-improvement - number of farm magazines read, number of farm radio programs he listens to and farm TV programs he watches
    - j. Number of farm management meetings attended in current course
    - k. Length of instruction time

    l. Length of time between first instructional unit and post-test
    m. Age of teacher
    n. Years of teaching vocational agriculture
    o. Single or multiple teacher department
    p. Advanced degree of teacher

4. To conduct a teacher appraisal of the developed instructional units.
5. To conduct a young adult farmer appraisal of the developed instructional units.

Procedures Employed in the Study

The procedures employed in this study were designed to develop and test the effectiveness of instructional units which stress the farm management principle approach to farm management instruction.

The principle investigator developed the first draft of the instructional units and they were then submitted to a jury of consultants for constructive criticism. The units were subsequently revised and printed for distribution to the participating teachers.

The prepared units were designed to be presented in three meetings. The first unit stressed the relationship of goals to decision making. The second unit illustrated the principle of diminishing returns and the concept of fixed-variable costs while the third unit illustrated the principles of substitution and opportunity costs and the concept of profitable enterprise combinations.

The learning principle of apperception, where one perceives new situations in terms of old, was utilized throughout the units. Common examples were presented to illustrate the application of each farm management principle to decision making.

The examples were taken from ordinary farm situations that were relevant to the students' background.

Careful selection was made of experimental and control schools used to appraise the effectiveness of the developed instructional units. To be eligible to participate in the project, the teacher, (1) must have taught young farmers at least one year, (2) must be planning to conduct a young farmer program during the current year, (3) must have a farm management emphasis in his curriculum, and (4) must be willing to participate in the young adult farmer farm management study.

Twenty-eight teachers met the required criteria and stratified random sampling procedures were used to assign each teacher to one of the three groups: Experimental A, Experimental B, and Control C. Teachers in Experimental Group A used the prepared instructional units after receiving in-service training instruction on their use. Experimental Group B used the units without the benefit of prior instruction and Control Group C taught farm management by using the traditional techniques.

The principal investigator visited all of the teachers in the study to (a) become acquainted with the instructional approach used in the control schools, and (b) distribute the instructional units to the experimental schools.

McCormick's testing instrument for measuring "Seven Profit-Maximizing Principles" was revised slightly to measure the young adult farmer understanding of farm management principles. Questionnaires were also prepared to determine the young adult farmer and teacher reaction to the instructional units.

The testing instrument was administered as a post-test with the questionnaires at the close of the third and last farm management meeting. The mean post-test scores of each treatment group, A - B - C, were subjected to the analysis of variance by the F test to determine which treatment was most effective as measured by the young adult farmer understanding of farm management principles.

The sixteen independent variables and mean post-test scores were also subjected to the analysis of variance by the F test to determine the relationship between the independent and dependent variables.

Teacher appriasal of the instructional units was secured by (a) a unit evaluation meeting for all experimental group teachers, and (b) an evaluation questionnaire completed by the teachers following completion of the units.

Young adult farmer appriasal of the instructional units was secured by having the students in the experimental groups react to an evaluation questionnaire upon the completion of the units.

Major Findings

The major findings derived from the analysis of data collected in this study are summarized according to the objectives.

First Objective - The first objective was to develop the farm management instructional units. This was achieved by the principal investigator and a jury of experts. A copy of the instructional units is enclosed in Appendix A.

Second Objective - The second objective was to determine which of three instructional approaches was the most effective. The teachers who used the prepared instructional units with the benefit of in-service training on the use of the units were the most effective. The young adult farmers in this group, Experimental Group A, had a mean post-test score of 27 out of a possible 39 multiple choice farm management questions.

The teachers who used the units without the benefit of in-service training ranked second in effectiveness out of the three instructional approaches. The students in Experimental Group B had a mean post-test score of 25.

The least effective instructional approach was the traditional manner of farm management instruction. The students in this group, Control Group C, had a mean post-test score of 24.6.

Each of the three groups was compared with each other by the analysis of variance statistical test to determine if the mean post-test scores were significantly different or if their difference could be attributed to chance. Table 22 reveals the homogeneous subsets of the mean post-test scores according to the instructional treatment received by the young adult farmers. The mean post-test scores of the three groups with a common bar were found not to be significantly different according to the one way analysis by the F test.

TABLE 22

Homogeneous Subsets of Mean Post-Test Scores
According to Instructional Treatment*

Group A	Group B	Group C
27	25	24.6
▭▭▭▭	▭▭▭▭	
	▭▭▭▭	▭▭▭▭

*The mean post-test scores with a common bar were found not to be significantly different according to the F test.

The only difference found among the three groups at the .05 level of confidence was between Experimental Group A, 27, and Control Group C, 25. Therefore, the first hypothesis, H_{1a} $\overline{X}_A > \overline{X}_C$ was accepted. While accepting this hypothesis, however, the researcher is aware of the fact that this difference is quite small even though it is significant.

The mean post-test scores of Experimental Group B and Control Group C were similar, 25 and 24.6 respectively, therefore, the second hypothesis, H_{1b} $\overline{X}_B > \overline{X}_C$, was rejected.

The difference between Experimental Group A and Experimental Group B was considerable, 27 to 25 respectively, but not significant at the .05 level. The third hypothesis, H_2 $\overline{X}_A > \overline{X}_B$, was therefore rejected.

It would be unfair to dismiss the second and third hypotheses merely because they were rejected according to statistical analysis. The results of these two hypotheses clearly indicate the value of in-service training when introducing a new instructional approach. A trend in the results of the analysis reveals that the difference between Experimental Group A (with in-service training) and Experimental Group B (without in-service training) would have been significant had there been as many respondents in Group B as in Group A.

Another factor relevant to the statistical analysis of this study is the fact that there were no norms in New York State with which a comparison of mean post-test scores could be made. The presence of such norms would have made the results more meaningful.

The researcher concludes from the analysis of the data that the prepared instructional units were more effective than the traditional techniques of farm management instruction and also that in-service training is imperative when introducing a new instructional approach.

Third Objective - The third objective was to determine if the independent variables had an influence on the young adult farmer understanding of farm management principles. Table 23 is a summary of the relationship of 16 independent variables with young adult farmer understanding of farm management principles.

Four of the sixteen variables proved to be significantly related to the young adult farmer understanding of farm management principles as measured by the mean post-test scores. These four were:

1. Managerial status of the young adult farmers
2. Formal education of the young adult farmers
3. The number of farm management meetings attended by students in the experimental groups
4. Advanced degree of the teacher

It should be noted that the advanced degree of the teacher had a negative influence on the mean post-test scores.

Three variables had a minor influence on the students' mean post-test scores. They were:

1. Age of the young adult farmer
2. Their years of managerial responsibility
3. Their marital status

The remaining nine variables proved not to be significantly related to student post-test scores:

1. Size of farm business
2. Years enrolled in vocational agriculture
3. Full or part-time farmer

TABLE 23

Relationship of Independent Variables With Young Adult Farmer Understanding of Farm Management Principles

Independent Variable	A None	A Minor	A Significant	B None	B Minor	B Significant	C None	C Minor	C Significant	All Groups None	All Groups Minor	All Groups Significant
Young Adult Farmer												
1. Age	X			X					X		X	
2. Years of managerial responsibility	X			X					X		X	
3. Managerial Status	X			X					X			X
4. Size of business	X			X			X			X		
5. Marital status	X			X					X		X	
6. Formal education		X			X				X			X
7. Years of Vo-Ag	X			X			X			X		
8. Full or part-time farmer	X			X			X			X		
9. Interest in self-improvement	X			X			X			X		
10. Meetings attended			X			X						X[a]
11. Length of instruction time	X			X						X[a]		
12. Time between first unit and post-test	X			X						X[a]		
Teacher												
13. Age	X			X					X[b]	X		
14. Years of teaching experience	X			X					X[b]	X		
15. Single or multiple teacher department	X			X			X			X		
16. Advanced degree	X			X			X					X[c]

[a] Does not include the Control Group C

[b] Does not reveal a consistent direction

[c] Reveals a negative influence

4. Interest in self-improvement
5. Length of instruction time in the experimental groups
6. Time between first farm management unit and post-test in the experimental groups
7. Teacher's age
8. Years of teaching experience
9. Single or multiple teacher department

A further study of the independent variables reveals a close relationship among four of the variables that influenced mean post-test scores. These four are age of student, management status, marital status, and years of managerial responsibility. The students who worked at home or were hired hands, tended to be younger, single, and fewer years of managerial responsibility and scored significantly lower on the post-test exam.

Another close look at the independent variables revealed that they had very little influence on the students in the experimental groups. Only two, formal education and meetings attended, influenced the scores of students who received instruction from the prepared instructional units. This would appear to be another advantage that the farm management principle approach has over the traditional technique of teaching farm management.

Since some of the variables showed a relationship, hypothesis number three, that stated that there will be a relationship between the independent variables and student level of understanding farm management principles, was accepted.

Fourth Objective - The fourth objective was to conduct a teacher evaluation of the prepared instructional units. Teacher evaluation of the instructional units was found to be helpful in appraising their effectiveness.

Results from the unit evaluation meeting and teacher questionnaires indicated that the teachers were very much in favor of the prepared instructional units. They found them educationally sound and particularly helpful because little preparation time was necessary. They were critical about some aspects of the units and made many suggestions for improvement.

Fifth Objective - The fifth objective was to conduct a young adult farmer reaction to the instructional units. Their reaction was considered useful in evaluating the units and helpful toward improving them.

The student's reaction, like the teacher's, was favorable. They felt that the units stimulated their thinking about farm business analysis and farm planning. They also were critical of some aspects of the units and made helpful suggestions for improvement.

Conclusions

The following conclusions were made by the principal investigator, based on his interpretation of the analysis of data and information presented in this study:

1. The farm management principle approach to instruction, as demonstrated in the prepared instructional units, was more effective than the traditional techniques of teaching farm management.
2. Prior instruction for the teacher on the use of the instructional units proved to be effective as measured by the young adult farmer understanding of farm management principles.

3. Young adult farmer understanding of farm management principles was influenced positively by the association of six independent variables. They were:
   a. Age of the young adult farmer
   b. Years of managerial responsibility by the young adult farmer
   c. Managerial status of the young adult farmer
   d. Marital status of the young adult farmer
   e. Formal education of the young adult farmer
   f. Number of farm management meetings attended
4. Independent variables have less influence on young adult farmer understanding of farm management principles when teachers use the farm management principle approach to farm management instruction.
5. The teachers' reaction to the farm management instructional units was very favorable. They felt that the farm management principle approach was educationally sound and that the prepared units were very helpful.
6. The young adult farmer reaction to the farm management instructional units was varied, though generally very favorable.

Implications

The central purpose of this study was to develop and evaluate instructional units for young adult farmers that emphasize the farm management principle approach to farm management instruction. The criteria used to evaluate the prepared instructional units were (1) student scores on the farm management quiz, (2) teacher reaction to the instructional units and, (3) young adult farmer reaction to the instructional units. The instructional units successfully passed each of these criterion tests.

Young adult farmers who received farm management instruction by the farm management principle approach that was utilized in the developed instructional units had a greater level of understanding farm management principles than those who were instructed in the traditional farm management manner. This was revealed by a post-test farm management exam administered to all young adult farmers in the study. The researcher is aware that the difference was small but significant at the .05 level of confidence.

The credibility of the test scores would have been greater if they could have been compared with norms in New York State. Such norms were unavailable.

The study also emphasized the importance of in-service training for teachers when introducing a new instructional approach.

The teacher and student reaction regarding the instructional units was very favorable. Both groups felt that the farm management principle approach to decision making was logical, thought provoking, and improved the young adult farmers' ability to make management decisions.

The results of this study reinforces the researcher's opinion that the 'principles' approach to farm management instruction is considerably more effective than traditional techniques. Teachers can also adapt this approach to other learning situations, for if a student can learn to approach a problem in a logical manner, using time tested management principles, he can use this approach with all management decisions.

Recommendations

As a result of the findings of this study, the following recommentations are made:

1. That the instructional units be revised according to the suggestions made by the teachers and young adult-farmers and be made available to agriculture teachers.
2. That the revised instructional units be field tested for effectiveness.
3. That the farm management exam used for evaluating the instructional units be revised to reflect more accurately farm management problems in New York State.
4. That in-service training be offered to agriculture teachers to further acquaint them with the farm management principle approach to farm management instruction.
5. That prospective agriculture teachers be given experience in using the farm management principle approach to farm management instruction during undergraduate study and student teaching.
6. That further attention be given to the principle approach in other aspects of vocational agriculture.

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APPENDIX A

INSTRUCTIONAL UNITS

USING FARM MANAGEMENT PRINCIPLES WHEN MAKING DECISIONS

INSTRUCTIONAL UNITS FOR VOCATIONAL AGRICULTURE
YOUNG FARMER PROGRAMS

U. S. O. E. Project No. 8-B-097
Grant No. OEG-2-9-420097-1004-(010)

Edited by
Harry E. Peirce
(Principal Investigator)

Project Director: William E. Drake

Division of Agricultural Education
Cornell University
Ithaca, New York

To The Teacher:

Regarding field testing of the instructional units titled "Using Farm Management Principles When Making Decisions."

This is the first time these instructional units have been used in their present form by a relatively large number of vocational agriculture teachers. They will be revised again in the spring following their use in a number of young farmer classes in New York this winter. The revisions that will be made will depend on the reactions of the teachers and the young farmers.

The teachers' reaction will be determined in two ways.

(1) Teachers will be requested to fill out a unit appraisal questionnaire upon completion of the instructional units.

(2) There will also be a unit appraisal meeting with the teachers upon the completion of the units (probably in February or March).

The young farmers' reaction to the units will be determined by having them fill out a unit appraisal questionnaire also.

A 39 question multiple choice quiz will be administered to the young farmers upon the completion of the units to measure their understanding of farm management principles. Needless to say, it is recommended that the young farmers NOT be notified of the forthcoming quiz or the attendance that evening may suffer measurably.

Sufficient copies of the quiz will be mailed to you prior to the date you expect to give it. All young farmers who attended at least one of the meetings should be requested to complete the quiz (if they attend the meeting when you give the quiz). All copies of the quiz should then be returned to Cornell for grading and tabulating.

The units are designed for three 2-hour meetings, however, the teacher may find that it takes less or more time to cover the material. Please take note of the amount of time that it takes to complete the units.

In this type of project it is very important that the units be presented as uniformly as possible. That is, all the material in the units should be covered in class. I encourage you, however, to add additional examples of the applications of the principles and concepts and also add additional discussion questions in order to encourage participation by the young farmers.

Additional copies of the Goals Worksheet are included for the young farmers' use only. It is recommended that the young farmer take the goals worksheet home between the first and second meeting and fill it out with assistance from his wife or parent as the case may be. The primary purpose of the unit on goals is to show the important relationship between the establishment of goals and the use of farm management principles when making decisions. A secondary purpose of this unit is to motivate a desire on the part of the young farmer to want to learn more about how to make wise decisions. The goals worksheet should remind the young farmer that: (1) there are goals that he desires, (2) most of these goals require additional income, (3) production generally must be increased in order to increase income, (4) changes must be made in production methods in order to increase production, and (5) farm management principles should be used when making changes (decisions) in order to make the most efficient use of his resources. The young farmers are requested to fill out the goals worksheet and bring it back to the second meeting primarily to show that they filled it out. The worksheet is for their use only.

POOR ORIGINAL COPY - BEST
AVAILABLE AT TIME FILMED

FOREWORD

The purpose of these instructional units is to aid the teacher in improving the young farmers' ability to understand and use farm management principles when making decisions.

Research reveals that the farmer who has the best understanding of farm management principles and knows how to apply them to his farm business decisions is the most successful. Some farm management principle instructional units at the secondary level are available, however, there is a need for instructional units which teachers can use in their young farmer classes. The purpose of this project is to fulfill this need.

Each instructional unit consists of the following sections:

1. Unit objective
2. Decision to be made
3. Factors affecting the decision
4. Topical outline
5. Introduction
6. Farm management principle
7. Examples that illustrate the principle
8. Discussion questions
9. Conclusions
10. Additional applications of the principle
11. References

Unit Objectives

The objectives of each unit lead to the ultimate objective of enabling young farmers to improve their ability to use farm management principles when making decisions. Some teachers may want to measure the young farmers' understanding of farm management principles by using a farm management quiz (as you are requested to do in the field testing of these units). Other teachers will appraise the relative behavioral change in the young farmers during subsequent farm visits.

Decisions and Factors

Each unit has a major decision that leads to the achievement of the unit objective. The factors listed are suggested as pertinent considerations that influence the decision.

Topical Outline

The topical outline for each unit is the major divisions of the teaching procedures to be followed.

Introduction

The introduction of each unit is designed to focus the young farmers' attention on the importance of the relationship of that particular principle or concept to decision making.

Farm Management Principles

The farm management principles and concepts are presented in terms that are familiar to the young farmer. The term, "farm management principle," is used throughout the instructional units in lieu of the longer, more technically appropriate phrase, "basic economic principles used when making farm management decisions." The following farm management principles are illustrated in these units: diminishing returns, substitution, and opportunity costs. Three additional farm management concepts that are pertinent to decision making are also illustrated. They are establishment of goals, fixed variable cost relationships, and profitable enterprise relationships.

Discussion Questions

The discussion questions are intended to stimulate thinking and activity on the part of the young farmer. The teacher is encouraged to add additional questions.

Conclusions

Several conclusions are drawn from each example in order to illustrate the relationship between the example and the farm management principle or concept.

Additional Applications of the Principle

In addition to the illustrated examples there is a list of additional decisions where the application of the principle or concept will apply. The young farmers should also be encouraged to think of additional applications of the principle.

References

A list of farm management references is located at the end of each unit. The teacher will find that this resource material will help him gain a better understanding of applications of farm management principles.

Some of the young farmers may want to follow-up the goals worksheet exercise with a farm plan that outlines the production changes to be made. Most teachers will welcome this interest depending on the balance of the young farmer meetings already scheduled. These decision-making instructional units logically lead to units on farm planning and budgeting, record keeping, and farm business analysis.

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INSTRUCTIONAL UNIT OUTLINE

Using Farm Management Principles When Making Decisions

Objective: To enable young farmers to improve their ability to use farm management principles* when making decisions.

Decisions	Factors
1. What are appropriate family and production goals for young farmers to use when making decisions?	1. a. Contribution to personal satisfaction
	b. Contribution to productivity
2. What farm management principles can young farmers utilize when making decisions and when should they be used?	2. a. Profitability
	b. Greatest profit
	c. Best use of resources

Unit Objectives

Unit One:	To enable young farmers to improve their ability to establish goals that are vital in the farm management decision making process.
Unit Two:	To enable young farmers to improve their ability to use the diminishing returns farm management principle and fixed-variable cost relationship when making decisions.
Unit Three:	To enable young farmers to improve their ability to use substitution and opportunity costs farm management principles and profitable enterprise combinations when making decisions.

---

*The term, "farm management principle," is used throughout these instructional units in lieu of the longer, more technically appropriate phrase, "basic economic principles used when making farm management decisions."

FIRST MEETING

Using Farm Management Principles When Making Decisions

Unit One Objective: To enable young farmers to improve their ability to establish goals that are vital in the farm management decision making process.

Decisions	Factors
1. What are appropriate family goals for young farmers?	1. Values and contribution to personal satisfaction
2. What are appropriate production goals to use when making decisions?	2. a. Family goals b. Income needed to meet desired family goals c. Production required to meet income needs

Topical Outline:

A. Introduction
B. Relationship of Goals to Decision Making
C. Family Goals
D. Production Goals
E. Changes in Production Methods Required to Increase Production
F. Conclusions
G. References

A. Introduction

Overview of objectives of meetings to be devoted to the use of farm management principles when making decisions.

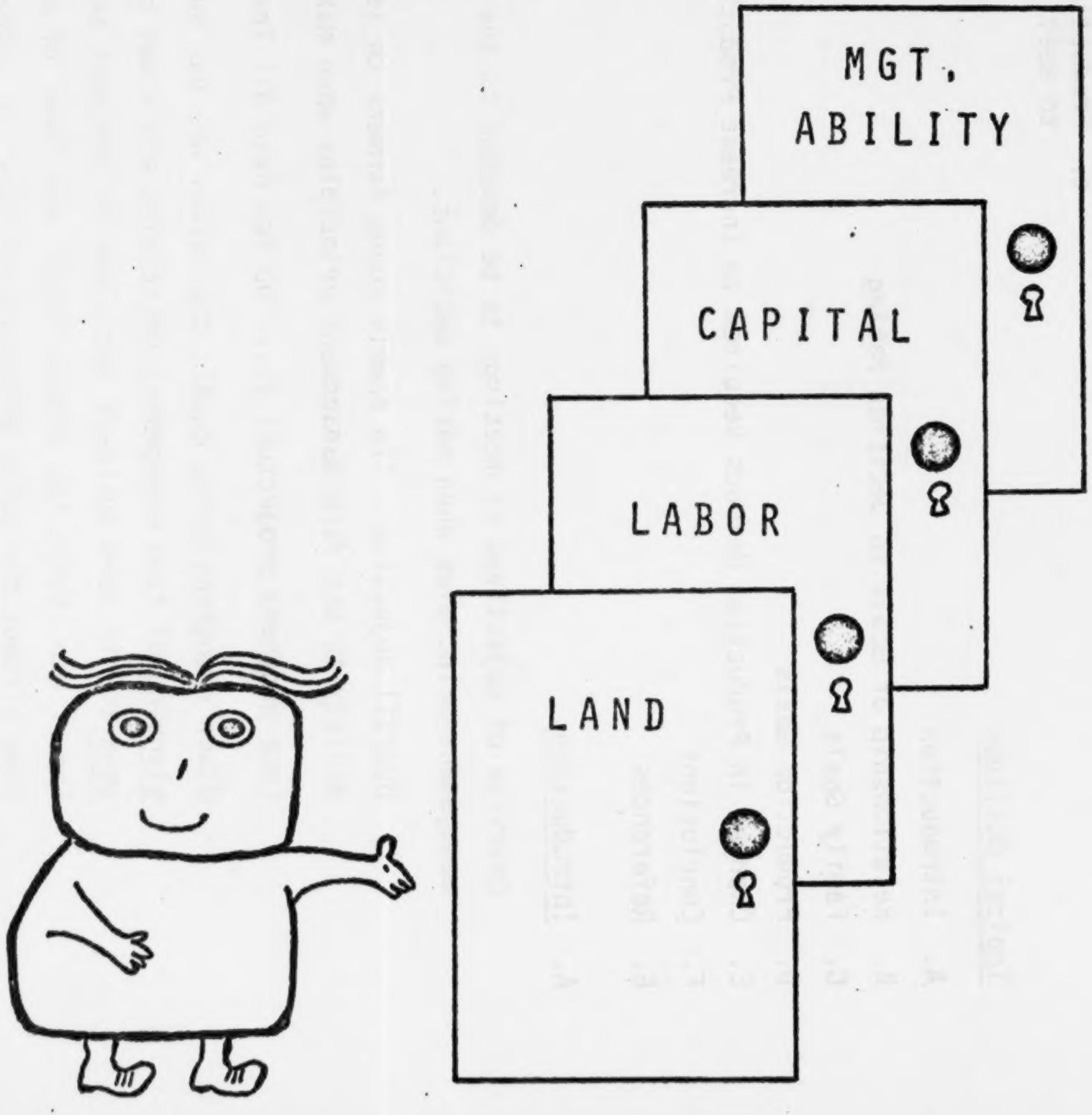
1. Overall objective: "To enable young farmers to improve their ability to use farm management principles when making decisions."

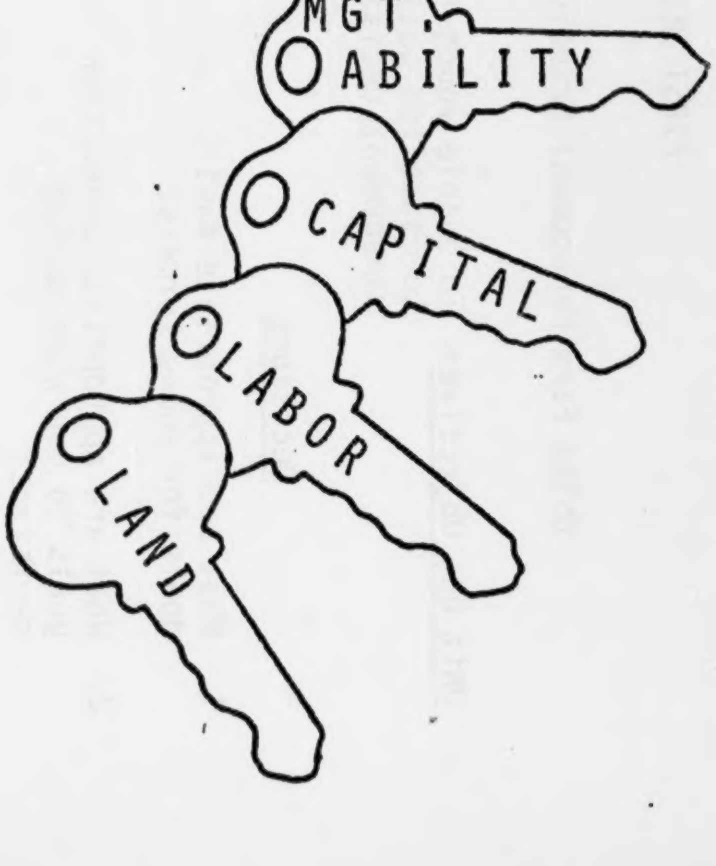
   (Use overhead projectual #1., "Do You Have All The Keys?")

   Other resources being equal, the farmer who has the best understanding of farm management principles and knows how to apply them to his farm business decisions is the most successful. The farmer who learns the simple "what" and "how" of a skill situation without the basic principle of "why" is extremely limited.

Do You Have All The Keys?

FAMILY SATISFACTION


MGT. ABILITY
CAPITAL
LABOR
LAND


MGT. ABILITY
CAPITAL
LABOR
LAND

2. First meeting: (1) Discuss the relationship of family goals and production goals to decision making, production changes, and farm management principles. (2) Discuss family goals, income needed to meet desired family goals, production required to meet income, changes in production methods required to increase production, and use of farm management principles when making decisions regarding production changes.

3. The second and third meetings will be devoted to the practical use of farm management principles when making decisions. The following principles will be discussed: diminishing returns, substitution, and opportunity costs. The fixed-variable cost relationship and combination of enterprises will also be discussed.

   The discussions will focus on (1) the wise use of limited resources (money, land, and labor) and (2) logical situations that illustrate the application of farm management principles to decision making.

B. Relationship of Goals to Decision Making

(Use overhead projectual #2.)

A person planning a trip naturally determines his destination (goal) before deciding on the best route to travel. In similar fashion a farmer's goals are directly related to the decisions he makes. If his needs and desires (goals) are modest, especially in relation to his resources, the production practices need not be as intensive as would be required if his needs and desires are greater.

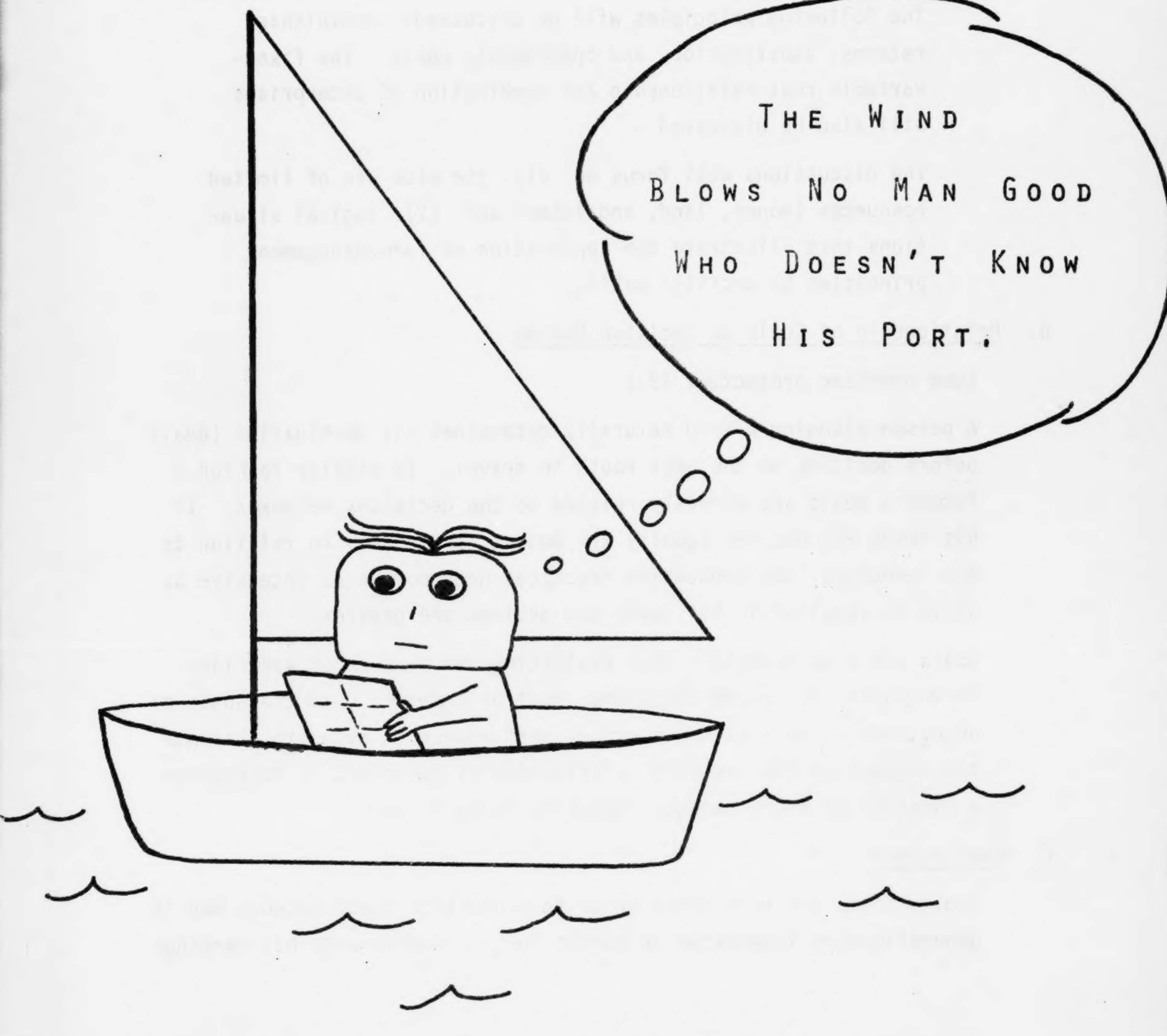
Goals are also necessary when evaluating the success of decisions. Performance, following decisions, must be compared with the goals or objectives as well as the previous performance in order to evaluate the success of the decision. Evaluation of decisions is considered a function of every manager including young farmers.

C. Family Goals

Family goals are considered prior to production goals because man is generally more interested in caring for his family with his earnings

DETERMINE DESTINATION (GOALS)

BEFORE CHARTING COURSE (FARM PLANNING)


THE WIND BLOWS NO MAN GOOD WHO DOESN'T KNOW HIS PORT.

rather than in the earnings alone. The family goals set by a young farm couple will depend on their values, that is, things that are important to them.

The young farmer's family will usually consider the following family and farm characteristics when developing their family goals:

1. Family aspirations and desires
2. Family cultural and social values
3. Size of family
4. Age of operator
5. Size and type of farm business
6. Financial structure of farm business

The first four, 1-2-3-4, relate to family characteristics, while 5 and 6 relate to the production characteristics of the farm business. (It is suggested that the teacher place these characteristics on the chalk board and ask that the young farmers add any additional factors that they believe should be considered when setting family goals.)

Family goals should contribute to the personal satisfaction of the members of the family; consequently, the whole family should be involved in determining the goals.

Young farmers generally have limited resources; therefore, they must place a priority on their various family goals. In determining the priority of their goals, they must determine which are more important: contribution to productivity or contribution to personal satisfaction.

Long range goals should be determined first, then intermediate (5 to 10 years) and finally the immediate goals (one year). The immediate goals should lead to the intermediate and the intermediate to the long range. The practical farmer will be realistic as he sets his goals keeping in mind his personal, financial, and farm resources.

(Use overhead projectual #3, "Goals Worksheet.")

The family goals listed in the example illustrate the type of goals that young farm couples can be thinking about. The young farmer

GOALS WORKSHEET

	SAMPLE FAMILY GOALS	POSSIBLE INCOME NEEDED	SAMPLE PRODUCTION GOALS	POSSIBLE CHANGES NEEDED
Long Term	To provide a comfortable home and home life for my family To be able to assist children with a higher education To be able to help children get a start in farming or other business Annual 2-week vacation Adequate retirement	$10,000 annual net income $80,000 net worth	60 cow herd 14,000 # milk average/cow 3.8 ton of hay/acre 18 ton of corn silage/acre 100 bushels of corn grain/acre	Test & cull cows according to production Use best sires Soil test and fertilize all crop acres Select best varieties of seed Expand farm 80 acres Replace equipment as needed Remodel dairy facilities
Short Term	Buy new washing machine Buy teeth braces for daughter Vacation trip to Expo Start savings account for children	$7,000 annual net income Increase net worth $6000	Increase herd size from 38 to 42 cows Boost milk production from 11,000 to 12,000 per cow Boost hay production from 2.2 ton to 2.8 ton/acre Boost corn silage production from 14 ton to 16 ton/acre Boost corn grain production from 75 bu to 85 bu/acre	Buy two bred heifers Join D. H. I. A. Breed artificially Soil test and fertilize all crops Select best varieties of seed Join Electronic Accounting Program

Overhead Projectual #3

GOALS WORKSHEET

	SAMPLE FAMILY GOALS	POSSIBLE INCOME NEEDED	SAMPLE PRODUCTION GOALS	POSSIBLE CHANGES NEEDED
LONG TERM	COMFORTABLE HOME LIFE FOR FAMILY CHILDREN'S EDUCATION ANNUAL VACATION ADEQUATE RETIREMENT	$10,000 NET INCOME $80,000 NET WORTH	60 COWS 14,000# AVE. 3.8 T HAY/A 18 T SILAGE/A 100 BU. CORN/A	
SHORT TERM	NEW WASHING MACHINE BRACES FOR DAUGHTER TRIP TO EXPO	$7,000 NET INCOME INCREASE NET WORTH $6,000	ADD 4 COWS INCREASE PRODUCTION 1,000# MILK/COW 2 T SILAGE/A 10 BU. CORN/A .5 T HAY/A	

GOALS WORKSHEET

	FAMILY GOALS	INCOME NEEDED	PRODUCTION GOALS	CHANGES NEEDED
Long Term				
Short Term				

should be encouraged to develop his own list of family goals after discussing these with his wife or parents, as the case may be, and return to the next class with this list. (Additional copies of the Goals Worksheet are enclosed for this purpose.) The section for intermediate goals has been omitted from the example worksheet, but can be added at the discretion of the teacher and/or the young farmer.

D. Production Goals

1. After family goals have been selected, there are two logical steps to follow in order to determine the production goals.

   (Use overhead projectual #3, "Goals Worksheet.")

   a. Determine the income needed to meet the desired family goals.

   b. Determine the production required to meet the income needs.

   The income needs for various goals will necessarily be estimates, but an effort must be made to estimate as accurately as possible. This applies also to the production goals required to meet the income needs.

2. There are three points that should be stressed in this phase of the determination of goals. These points are actually more important than the accuracy of the income needs and production needs (goals). The three points to stress are:

   a. Production should be increased to increase income.

   b. Changes must be made in production methods in order to increase production.

   c. Production goals must be realistic in view of present resources (land, capital, and labor).

3. If family goals cannot be achieved through realistic production goals, there are several alternatives available to the young farmer.

   a. Explore other combinations of enterprises that may result in more efficient use of resources, and therefore, yield a higher income. This may involve investing more labor and/or capital into the business or selecting enterprises involving higher risk while providing higher income potentials.

   b. Adjust family goals in line with available resources. It may be possible to meet family consumption needs with less funds, therefore, reducing the production goals.

   c. Consider part-time off-farm employment. This would require adjustments in organizing and operating a farm business on a part-time basis.

   d. Consider leaving the farm for full-time off-farm employment.

E. Changes in Production Methods Required to Increase Production

(Use overhead projectual # 4, "Relationship Between Changes and Family Goals.")

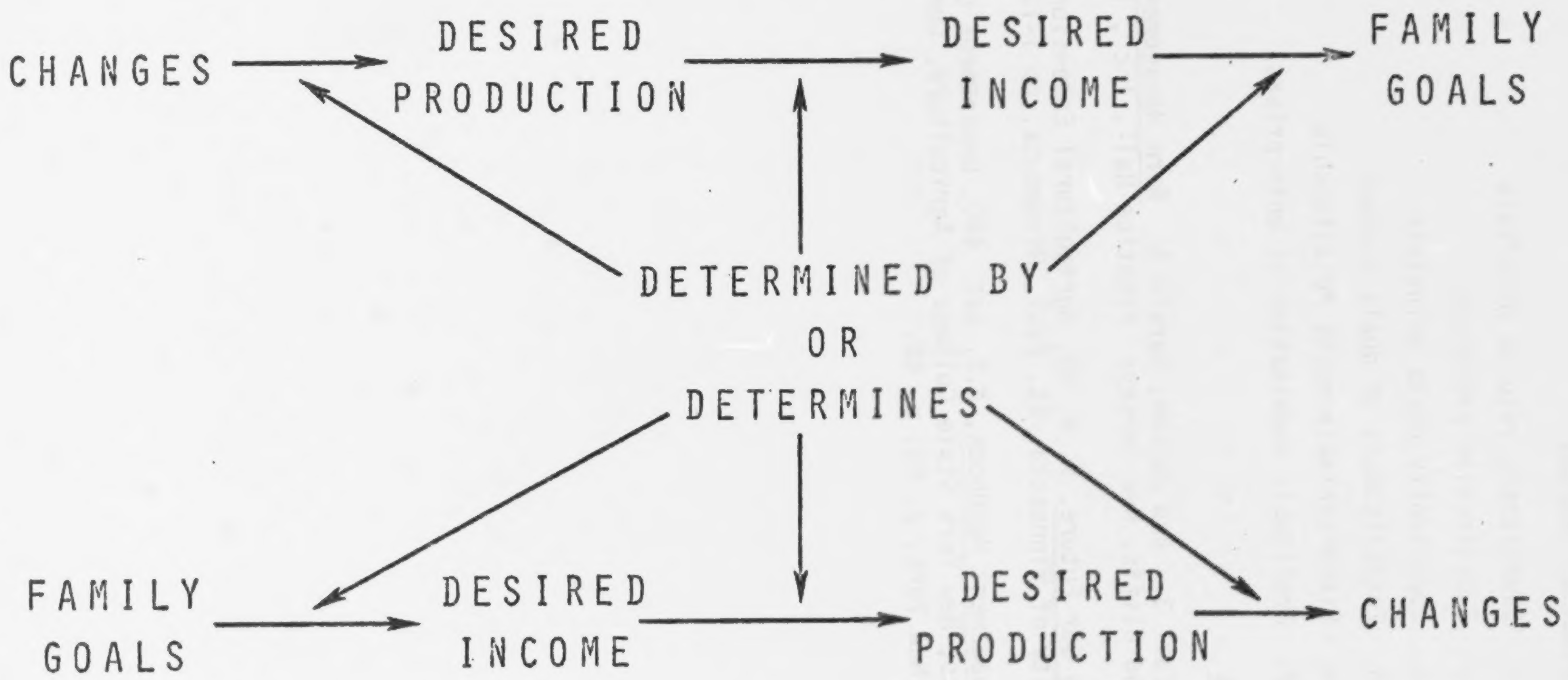
It is almost axiomatic to state that changes in production methods are always required in order to increase production. It does not follow, however, that the size of the production increases is in direct proportion to the number of changes made. This is not true because production changes are qualitative in nature. Some changes will have a greater effect than others, and it is also important to remember that certain production changes made simultaneously react in a catalytic fashion that boosts production at a greater rate than they would individually.

F. Conclusions

1. The establishment of goals is a very important step in the process of using farm management principles when making decisions.
2. The production changes that are planned are the means to accomplish the ends (family goals).
3. It is very important that the farm manager make wise use of his resources when making production changes.
4. Wise use of resources involves the understanding and use of the

Overhead Projectual #4

RELATIONSHIP BETWEEN CHANGES AND FAMILY GOALS


CHANGES
DESIRED PRODUCTION
DESIRED INCOME
FAMILY GOALS
DETERMINED BY
OR
DETERMINES
FAMILY GOALS
DESIRED INCOME
DESIRED PRODUCTION
CHANGES

following farm management principles and concepts when making production changes:

a. Diminishing returns principle
b. Substitution principle
c. Opportunity costs principle
d. Establishment of goals concept
e. Fixed-variable costs relationship
f. Profitable combination of enterprises

G. References

Heady, Earl O., and Jensen, Harald R. Farm Management Economics, Englewood Cliffs, New Jersey: Prentice Hall, Inc., 1958, pp 8-9.

Managing Our Future, F. M. 50, Agricultural Extension Service, University of Minnesota, St. Paul, Minnesota, pp 1-13.

Farm Management Handbook, A.E. Ext. 440, Department of Agricultural Economics, New York State College of Agriculture, Cornell University, Ithaca, New York, p. 66, p. 60.

SECOND MEETING

Using Farm Management Principles When Making Decisions

Unit Two Objective: To enable young farmers to improve their ability to use the diminishing returns farm management principle and fixed-variable cost relationship when making decisions.

Decision	Factors
What farm management principles can young farmers utilize when making decisions and when should they be used?	1. Profitability 2. Greatest profit 3. Best use of resources

It is recommended that each farm management principle be introduced in the following manner.

1. Ask the appropriate question, i. e. "Does it pay to make the proposed production change?"
2. State the principle and explain its relationship with the question.
3. Illustrate the principle with the appropriate examples on the overhead projectuals. If an overhead projector is unavailable, these may be duplicated or drawn on the chalk board.
4. Propose the discussion questions to the group for their reaction.
5. Draw conclusions from each example, illustrating the relationship with the principle.
6. Draw from the young farmer class some common production decisions where the use of the principle would be appropriate.

Some of the data and illustrations are based on available research, but it is not intended that this information be used as source material for production adjustments. The information is used only to show how the principles work. Consequently, you should direct attention to the principles and not to the data.

Topical Outline:

A. Introduction

B. Terminology

C. Diminishing Returns Principle

1. Diminishing Physical Returns
    - a. Example--Eating Fried Chicken
    - b. Example--Returns from Fertilizer Application

2. Diminishing Economic Returns

   Example--Returns from Fertilizer Application

D. Fixed-Variable Cost Relationship

   1. Example--Fixed Cost of Operating a Tractor
   2. Example--Fixed-Variable Cost of Producing Corn

E. References

A. Introduction

Review goals discussed at first meeting. Emphasize that attainment of goals is possible only if production changes are made. What changes should be made? The young farmer must be guided by farm management principles as he makes decisions and implements changes in order to increase production.

B. Terminology

Reduce farm management and agricultural economics jargon to the layman's level.

1. Farm management is sometimes referred to as the "science of decision making."
2. Farm management principles are sometimes referred to as "profit maximizing principles."
3. Several farm management principles can be reduced to three basic questions that a farmer must ask himself when making a decision. These questions refer to the factors that are considered when deciding which farm management principle is appropriate to use when making a decision.
   a. Will it pay?
   b. Will it return more than other alternative practices or uses of resources?
   c. Can the necessary investment be used more profitably in some other way?

(Use overhead projectual #5.)

If the farmer can answer YES to each of these questions, he should make the proposed change.

Overhead Projectual #5

CAN YOU ANSWER YES TO EACH OF THESE QUESTIONS THAT PERTAIN TO A PROPOSED PRODUCTION CHANGE?

1. WILL IT PAY? — Diminishing Returns

2. WILL IT RETURN MORE THAN OTHER ALTERNATIVE PRACTICES OR USES OF RESOURCES? — Substitution

3. IS THIS THE MOST PROFITABLE ALTERNATIVE USE OF THE INVESTMENT? — Opportunity Costs

Many successful farmers have been asking themselves these questions for years without being conscious of the fact that they are using farm management principles.

Question #1. "Will it pay?" illustrates the diminishing returns farm management principle.

Question #2. "Will it return more than other alternative practices or uses of resources?" illustrates the substitution farm management principle.

Question #3. "Can the necessary investment be used more profitably in some other way?" illustrates the opportunity costs farm management principle.

The relationship between these questions and their respective principles, if not exact, is clear enough to be pertinent and is a practical way to illustrate how and when to use these principles.

Several examples that illustrate these principles have been prepared on overhead projectuals to be used with the overhead projector. The instructor may wish to modify these to suit his particular situation.

C. Diminishing Returns Principle

"Will it pay to make the proposed production change?" The young farmer must determine if the proposed change will yield a return that is greater than the added investment.

The question can be converted to the diminishing returns principle by saying that, "The farm, in order to secure maximum profits, should continue adding variable resources to fixed resources as long as marginal returns are greater than marginal costs." In this case, the "added variable resource" and "marginal cost" are the increased investment as a result of the change. The marginal return is the increased return. If the marginal returns are indeed greater than the marginal costs, then "it does pay to make the proposed production change."

The diminishing return principle goes on to add that, "the application of additional units of variable resources to a unit of fixed resource, increases total output, but after a certain point, the amount added to total output by each successive unit of variable resource diminishes." As a consequence, it is called the diminishing returns principle.

The principle of diminishing returns can best be explained by dividing the discussion into two parts (1) physical returns and (2) economic returns. These can then be combined to illustrate the principle. The fixed cost-variable cost relationship is explained later in its relationship with the diminishing returns principle.

1. Diminishing Physical Returns

   (Use overhead projectual #6.)

   a. Example--Eating Fried Chicken

      Illustrate the diminishing physical returns principle by referring to the student's personal experiences when eating fried chicken (or any other tasty food such as cake, pizza, etc.).

      Show, with the use of the overhead projectual, that even if the supply of fried chicken is unlimited, the satisfaction achieved from each bite decreases after the first bite until a point is reached when an additional bite of fried chicken no longer results in satisfaction.

      Discussion Questions

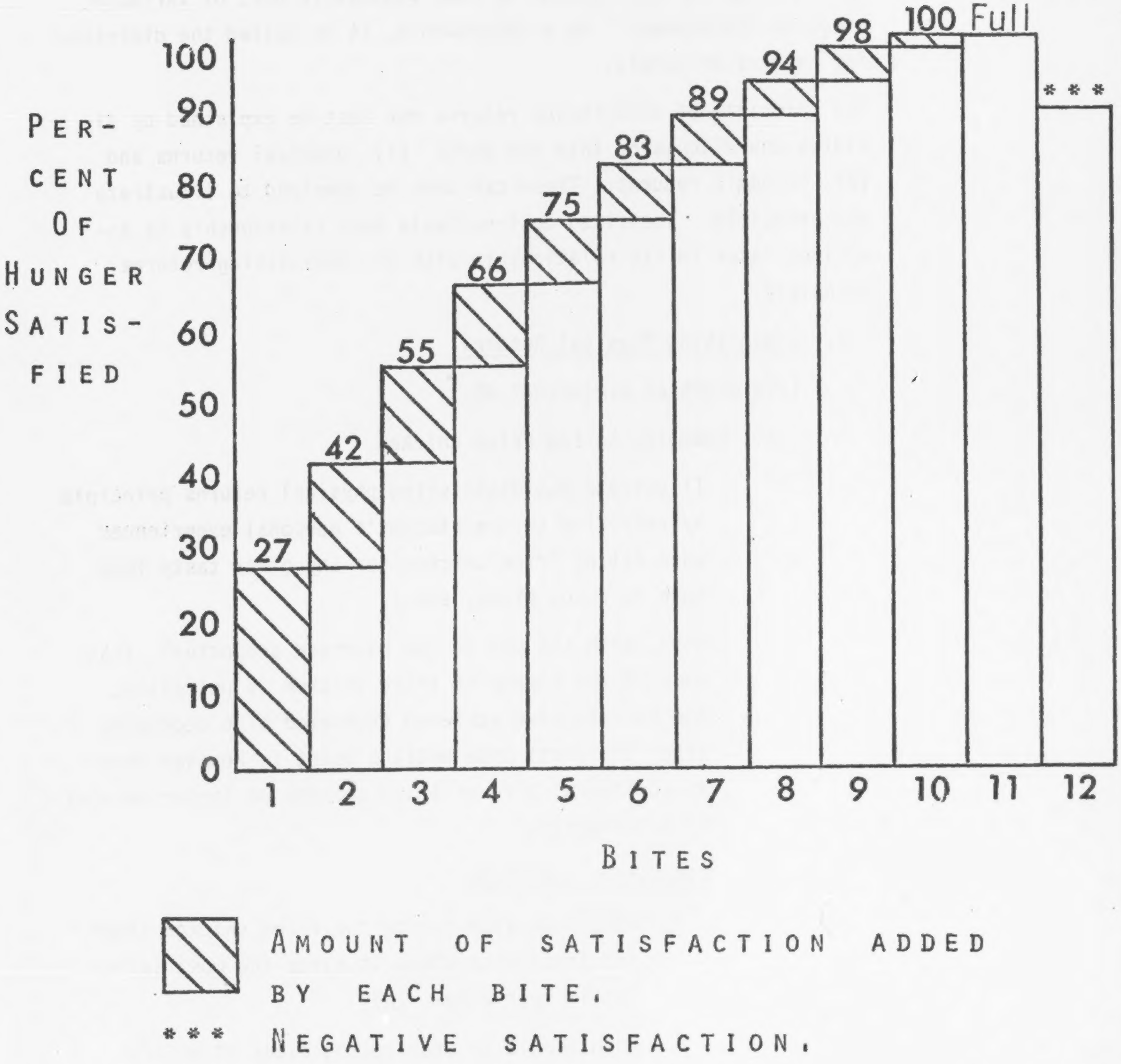
      1. Should we stop eating the fried chicken after the first bite since it gives the most satisfaction per bite? Why?
      2. When should we stop taking bites if we are interested in the greatest total satisfaction?

      Conclusions

      1. The added amount of satisfaction of our hunger

Overhead Projectual #6

CHART SHOWING SATISFACTION FROM EATING FRIED CHICKEN



Source: Adapted from chart in "Profit-Maximizing Principles," Department of Agricultural Education, The Ohio State University and Agricultural Education Service, State Department of Education, Columbus, Ohio, p. 17.

(marginal returns) diminishes as we eat more fried chicken and approach the full mark (diminishing physical returns).

2. At a certain point the amount of hunger satisfied (marginal returns) becomes negative with each additional bite (input). At this point we stop eating because "it no longer pays (in satisfaction) to eat any more."

b. Example--Diminishing Physical Returns from Fertilizer

(Use overhead projectual #7.)

This example, like the fried chicken example, illustrates that the response from increasing amounts of inputs (fertilizer) gradually diminishes and finally becomes a negative response. It is important to point out the added or marginal yield at each input level.

Discussion Questions

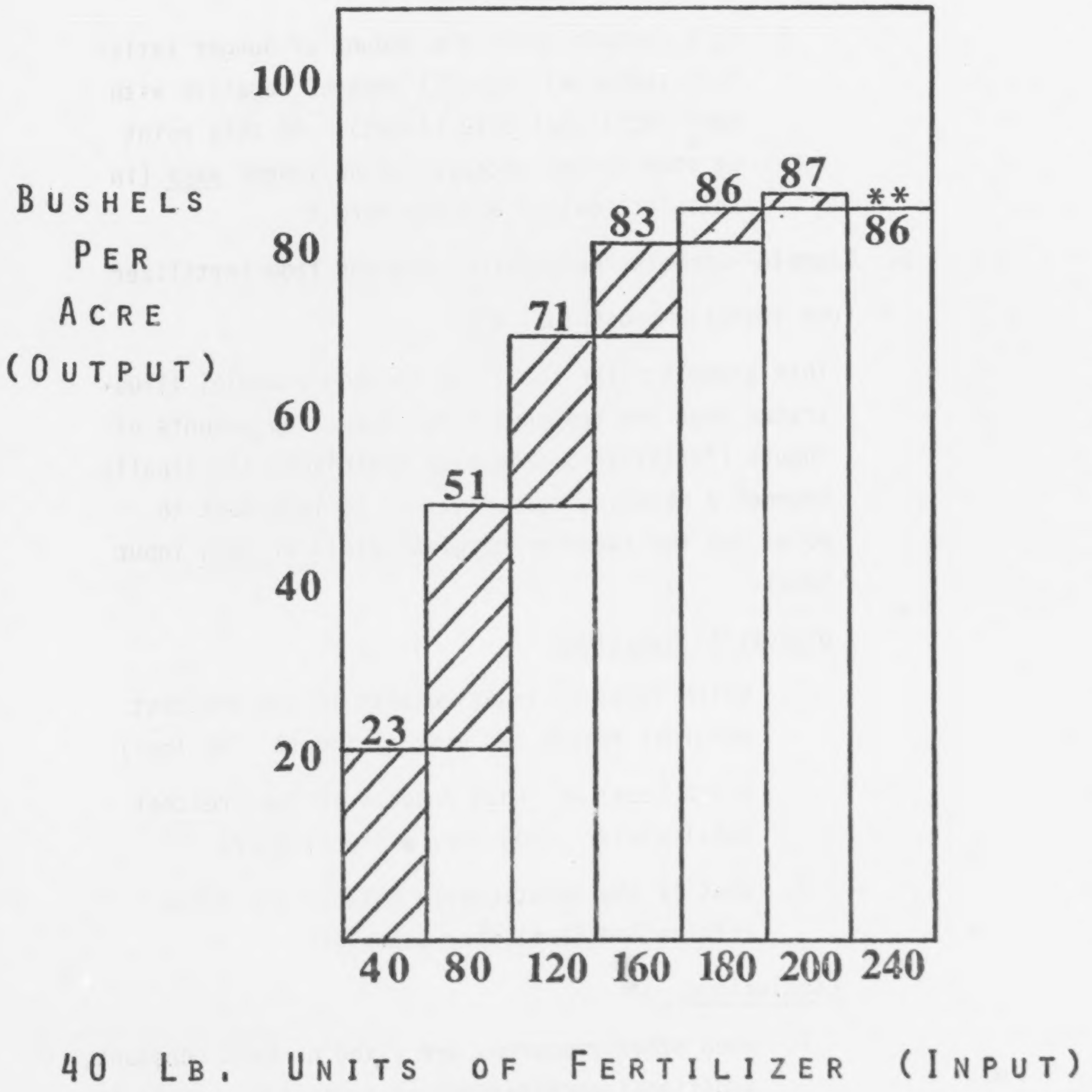
1. Which level of input results in the greatest marginal return per unit of input? (40 lbs.)
2. Which level of input results in the greatest total yield? (200 lbs. of fertilizer)
3. What is the relationship between the fried chicken and fertilizer examples?

Conclusions

1. When other resources are fixed or held constant, additional applications of fertilizer result in increased yields; however, the marginal yields decrease until they reach a negative response.
2. The successful farmer must be able to determine the level of fertilizer application that is the most profitable.

Overhead Projectual #7

DIMINISHING PHYSICAL RETURNS FROM FERTILIZER



▨ AMOUNT OF ADDITIONAL OUTPUT ADDED BY EACH SUCCESSIVE UNIT OF INPUT.

** NEGATIVE MARGINAL YIELD.

Source: "Agricultural Business Management--Principles That Affect Production," VAS 2040, University of Illinois, College of Agriculture, Vocational Agriculture Service, Urbana, Illinois, p. 6.

2. Diminishing Economic Returns

Example--Diminishing Economic Returns from Fertilizer

(Use overhead projectual #8.)

This example is a continuation of the preceeding one with economic values attached to the fertilizer and corn. Profitable decision making is dependent not only on accurate estimates of yields, but on the values attached to inputs (fertilizer, seed, gas, etc.) and outputs (corn yields).

Discussion Questions

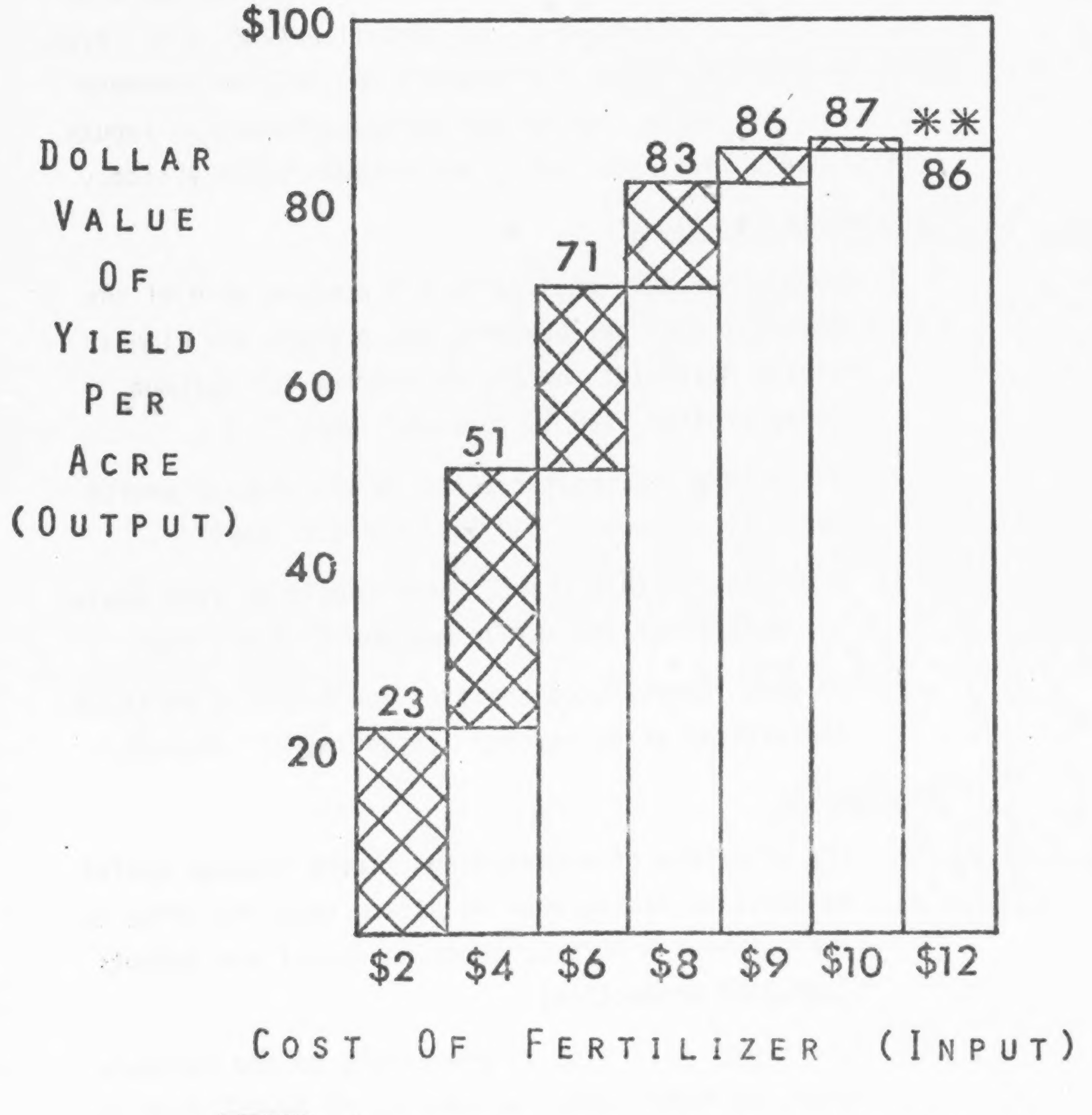
1. Should our main goal be to (1) produce corn at the cheapest cost per bushel?, (2) produce the highest yields possible?, or (3) to produce for maximum total profit? (#3 is correct) Why?
2. Which level of input results in the highest profit per unit of input? (40 lbs. for $2) Why?
3. According to this chart, where should we stop applying fertilizer to achieve maximum profit? Why?
4. Do more farmers stop short of the point of diminishing returns or go beyond? (Stop short) Explain.

Conclusions

1. The principle of diminishing returns becomes useful in decision making when we attach cost and price to the physical inputs (production costs) and outputs (value of production).
2. The farmer will find it profitable to add variable costs to fixed costs "as long as it pays;" that is, to obtain the most profitable returns, he must increase production until marginal costs equal marginal returns. (MC=MR) When marginal (increased) costs become higher than marginal (increased) returns, maximum profits will be reduced.
3. The location of the maximum profit point is a critical economic decision for all producers. To stop adding

Overhead Projectual #8

DIMINISHING ECONOMIC RETURNS FROM FERTILIZER



▨ AMOUNT OF ADDITIONAL OUTPUT ADDED BY EACH SUCCESSIVE UNIT OF INPUT.

✻✻ NEGATIVE MARGINAL RETURNS.

Source: "Agricultural Business Management--Principles That Affect Production," VAS 2040, University of Illinois, College of Agriculture, Vocational Agriculture Service, Urbana, Illinois. p. 7.

inputs before this point is reached means that maximum profits will not be obtained.

Additional Applications of the Principle

1. What is the most profitable level of fertilizer application?
2. How much can a farmer afford to spend on seed?
3. Should a farmer treat his seed with fungicides and insecticides?
4. How much can a farmer afford to pay for protein supplement in a feeding ration?

Questions 1 and 4 can be answered by determining the maximum profit point (conclusion #3). Questions 2 and 3 can be answered by determining if it pays, that is, "Is the increased yield worth more than the increased cost?" The young farmers can also be asked to think of additional farm production decisions where the diminishing returns principle can be applied.

D. Fixed-Variable Cost Relationship

The concept of fixed and variable costs is very important in making farm production decisions. This is particularly true with decisions dealing with diminishing returns as the inputs in question generally fall in the variable cost category.

Fixed costs, sometimes called overhead costs, are the costs that do not change when production changes. Variable or operating costs, on the other hand, do change with production. Since the fixed costs for the year remain the same, the fixed cost per unit of production decrease as more units are produced.

When the decision maker asks the question, "Does the proposed change pay more than it costs?" he should compare the expected return with only the variable costs if the proposed change has no effect on the fixed costs.

Fixed and variable costs of operating a three plow tractor are illustrated in Table 1.

Table 1.

FIXED AND VARIABLE COSTS OF OPERATING FARM TRACTORS*

Three Plow Tractor Used 526 Hours

Annual Cost of Operation and Maintenance

Fixed Costs	
Depreciation	$150
Interest	68
Housing	17
Insurance	7
Total Fixed Costs	$242
Variable Costs	
Fuel	$156
Repairs	259
Tires	21
Labor for maintenance	61
Oil and grease	21
Miscellaneous	5
Total Variable Costs	$523
Total Costs for the Year	$765

*Source: New York Cost Account Farms, 1964, A. E. Res. 185.

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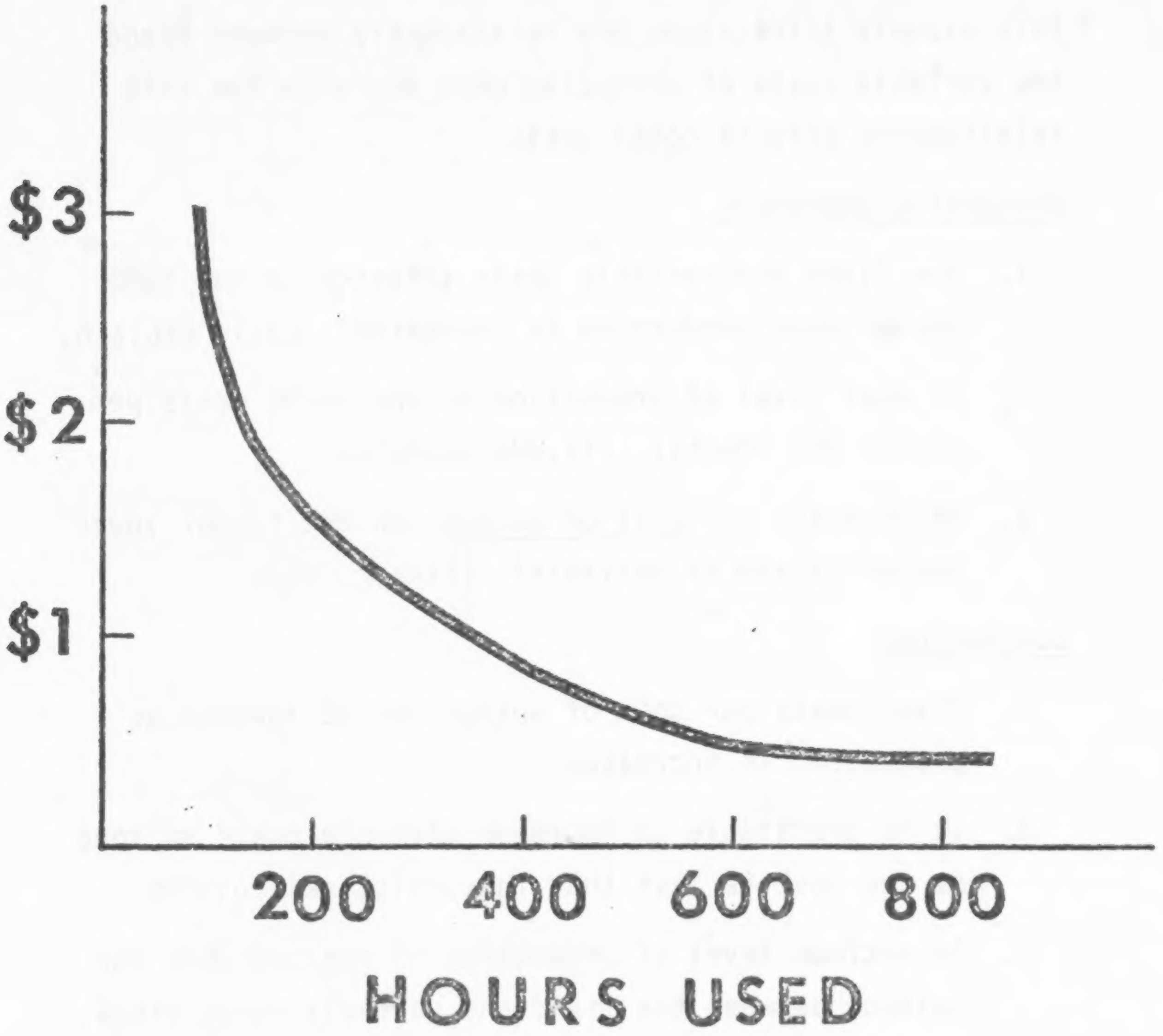
1. Example--Fixed Costs of Operating a Tractor
   (Use overhead projectual #9, "Fixed Cost Per Hour of Tractor Use.")

   This example illustrates the fixed costs of operating a three plow tractor. The total fixed costs remain the same regardless of the hours used. The fixed costs per hour decrease, however, as the hours of use increase.

FIXED COST PER HOUR OF TRACTOR USE



Source: Hypothetical chart patterned after data from New York Cost Account Farms, 1964, A. E. Res. 185.

Discussion Questions

1. Do variable costs per hour increase, decrease, or remain about the same as hours of tractor use increase? (Remain about the same) Why?
2. Do total costs per hour increase, decrease, or remain the same as hours of tractor use increase?
3. What other equipment would be appropriate for this example of efficiency?

2. Example--Fixed-Variable Cost of Producing Corn

(Use overhead projectual #10, "Fixed, Variable, and Total Costs of Producing Corn.")

This example illustrates the relationship between fixed and variable costs of producing corn and also how this relationship affects total costs.

Discussion Questions

1. Are fixed and variable costs affected in the same manner when production is increased? (No) Explain.
2. At what level of production is the total costs per bushel the lowest? (12,000 bushels)
3. Which costs per unit of output can the farmer lower easier, fixed or variable? (Fixed) Why?

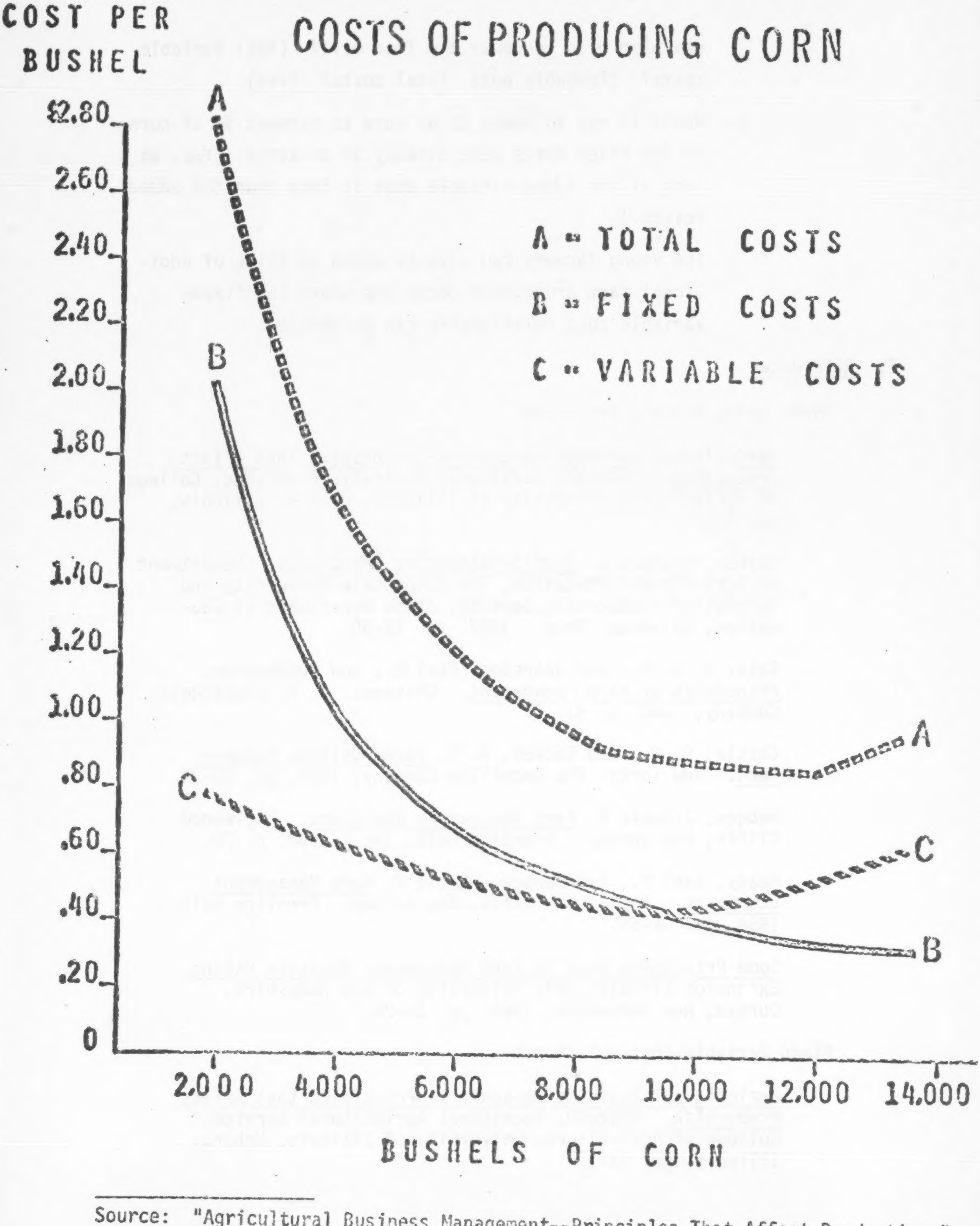
Conclusions

1. Fixed costs per unit of output can be lowered as production is increased.
2. It is profitable to increase variable costs as long as the cost is less than the additional returns.
3. An optimum level of production is reached when the balance between the fixed and variable costs gives maximum profit.

Additional Applications of the Concept

1. Would fixed costs per hour be lower if the tractor

FIXED, VARIABLE, AND TOTAL COSTS OF PRODUCING CORN



Source: "Agricultural Business Management--Principles That Affect Production," VAS 2040, University of Illinois, College of Agriculture, Vocational Agriculture Service, Urbana, Illinois, p. 12

was also used to power the feed mill? (Yes) Variable costs? (Probably not) Total costs? (Yes)

2. Would it pay to spend $5 an acre to harvest $8 of corn if the fixed costs were already $9 an acre? (Yes, as long as the added variable cost is less than the added return.)

The young farmers can also be asked to think of additional farm production decisions where the fixed-variable cost relationship can be applied.

E. References

Diminishing Returns Principle

Agricultural Business Management--Principles that Affect Production. VAS2040, Vocational Agriculture Service, College of Agriculture, University of Illinois, Urbana, Illinois, pp. 3-8.

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Some Principles Used in Farm Management Decision Making. Extension Circular 384, University of New Hampshire, Durham, New Hampshire, 1966, pp. 19-28.

Fixed Variable-Cost Relationship

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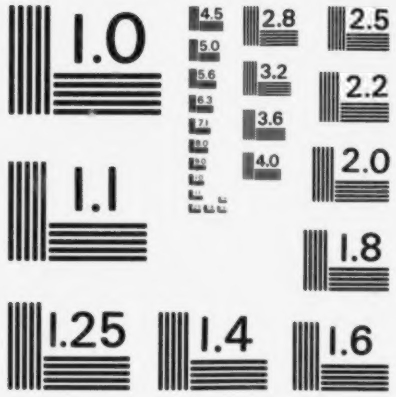
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MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

THIRD MEETING

Using Farm Management Principles When Making Decisions

Unit Three Objective: To enable young adult farmers to improve their ability to use substitution and opportunity costs farm management principles and profitable enterprise combinations when making decisions.

Decision	Factors
What farm management principles can young adult farmers utilize when making decisions and when should they be used?	1. Profitability 2. Greatest profit 3. Best use of resources

Topical Outline:

A. Introduction

B. Substitution Principle

   1. Example--Weed Control
   2. Example--Substituting Grain for Forage in the Dairy Ration

C. Opportunity Costs Principle

   1. Example--Comparative Net Returns from Three Alternative Uses of $2,000
   2. Example--Use of Capital

D. Profitable Enterprise Combinations

   1. Competitive Enterprise Relationship
   2. Supplementary Enterprise Relationship
   3. Complementary Enterprise Relationship

E. Summary--Using Farm Management Principles When Making Decisions

F. References

A. Introduction--Review first two units.

   1. Young adult farmers have goals that exceed their present standard of living.
   2. Production must be increased in order to accomplish their goals.
   3. Changes in production methods must take place in order to achieve production goals.

4. Farm management principles must be followed in making changes in order to make the best use of available resources and therefore assure achievement of production goals.

5. The young adult farmer must be able to answer YES to the following questions before making a change (or decision).

   a. Will it pay? (diminishing returns principle)

   b. Will it return more than alternative practices or uses of resources? (substitution principle)

   c. Can the necessary investment be used more profitably in some other way? (opportunity costs)

6. The diminishing returns principle can be stated, "The farmer, in order to secure maximum profits, should continue adding variable resources to fixed resources as long as added (marginal) returns are greater than added (marginal) costs," or "Does it pay to make the proposed change?"

B. Substitution Principle

Assuming that it does pay to make a change (in a production method), will it return more than alternative practices or uses of resources? If a farmer has a choice in profitable changes and has limited capital, he should select the one that is the most profitable. In every case of substitution of one input for another in the production of a given output, the farmer must decide which particular combination of inputs costs him the least and therefore returns (pays) the most.

Substitution principle--"Substitute one input for another as long as the cost of the new input is less than the cost of the input which it replaces--and output is maintained." When a farmer has a choice of practices or tools (inputs) that will accomplish the desired task (outputs) satisfactorily, he should select the practice or tool that is the cheapest.

1. Example--Weed Control

   (Use overhead projectual 11, "Weed Control.")

   Selecting the cheapest method of weed control in corn is a common example of the substitution principle. When a farmer

Overhead Projectual #11

WEED CONTROL EXAMPLE

CULTIVATION COSTS

80 ACRES x $1.75 = $140

TWICE FOR

SEASON 2 x $140 = $280

TOTAL CULTIVATION = $280

HERBICIDE WEED CONTROL COSTS

80 ACRES x $2 = $160

APPLICATION

80 ACRES x .50 = $ 40

TOTAL HERBICIDE = $200

CULTIVATION COSTS $280

HERBICIDE COSTS -200

NET SAVING FOR

HERBICIDE WEED CONTROL $ 80

Source: Profit-Maximizing Principles, Department of Agricultural Education, The Ohio State University and Agricultural Education Service, State Department of Education, Columbus, Ohio, p. 90.

has a choice of practices that will effectively control weeds, he should select the practice that will do the job the cheapest.

Discussion Questions

1. What are the inputs that can be substituted for each other in this example? (cultivation costs and herbicide costs) The outputs? (effective weed control in each case)
2. Which method has the least cost for inputs? (herbicide)
3. Is cost the only consideration in determining the method of weed control? (No. The crops that follow and the available equipment may be others.)

Conclusions

1. Both chemical and mechanical methods can be used to control weeds.
2. When all other considerations are equal, the least costly method of weed control should be used to maximize profits.
3. When substitution involves only one unit of each input, the only comparison that need be made is between the cost of the original practice and the one being substituted. The knowledge of complete and accurate costs of each practice is imperative if this principle is to be effective in decision making.

Additional Applications of the Principle

Similar examples of the substitution principle involving only one unit of input follow.

1. Choices of equipment to perform a job such as a tractor, sprayer, barn cleaner, silo unloader, milking machine, etc. (bear in mind all costs, depreciation, repairs, etc.)
2. Choice between raising silage or hay as a source of TDN in the dairy ration. (Good silage will usually substitute for good hay at a 3:1 ratio.) Production costs and

quality of the forage must be taken into consideration.

3. Choice of owning equipment vs. custom hiring.
4. Selection of a source of nitrogen fertilizer from anhydrous ammonia, granules, or liquid. Remember to include application costs along with the purchase price per pound of actual nitrogen.
5. Choice of lending agency. (Have the young farmer suggest additional examples.)

2. Example--Substituting Grain for Forage in Dairy Feeding

An input may not always substitute for another input at a constant rate. Some decisions involve diminishing substitution rates while others involve variable substitution rates. The farmer should remember to select the substitution rate that costs the least and therefore yields the greatest return (Will it return more than other alternative practices?). The principle again is, "Substitute one input for another as long as the cost of the new input is less than the cost of the input it replaces--and output is maintained."

(Use overhead projectual #12, "Substituting Grain for Forage.")

Grain substitutes for forage in the dairy ration at a variable substitution rate.

Discussion Questions

1. What happened when more grain was fed? Why? (As additional grain was fed, it replaced forage at a decreasing rate until it was no longer profitable.)
2. Did each additional unit of grain replace the same amount of forage as the previous unit? (No, it decreases.)
3. Which unit of grain replaced the greatest amount of forage? (3,400 lbs.)
4. At what point did an additional pound of grain replace less than a pound of forage? (4,800 lbs.) (Note that the cost of the grain and forage is just as important as the substitution rate.)

PHYSICAL AND ECONOMIC CONSEQUENCES OF SUBSTITUTING GRAIN FOR FORAGE IN FEEDING DAIRY COWS*

PHYSICAL					ECONOMIC		
X Forage (Lbs.)		Y Grain (Lbs.)		Grain-Forage Replacement Ratio	Value Of Forage Replaced	Cost Of Grain Added	Net Change In Cost
Total	Reduced	Total	Added				
10,000		3,000		XXX	--	--	--
8,000	-2,000	3,400	+400	5-1	$40	$16	-$24
6,200	-1,800	4,000	+600	3-1	36	24	- 12
6,000	- 200	4,800	+800	.25-1	4	32	+ 28

*ASSUME THAT MILK PRODUCTION IS HELD CONSTANT.

Conclusions

1. By substituting some items of inputs (grain) for other items (forage), the cost of operation or cost of production may be reduced.
2. Inputs may substitute for other inputs at varying rates.
3. The farmer should select the substitution rate that costs the least and therefore yields the greatest return.

Additional Applications of the Principle

Similar examples of the substitution principle involving variable substitution rates follow.

1. Substituting a protein supplement for grain in a feeding ration.
2. Substituting forage for grain in the dairy ration.
3. Substituting machinery for hand labor.
(Have young farmers suggest additional examples.)

C. Opportunity Costs Principle

Assuming that a proposed change does pay and does return more than alternative practices, the farmer should ask himself the question, "Can the necessary investment be used more profitably in some other way?"

The question can be converted to the opportunity costs principle by stating that, "The profit of a farm business will be greatest if each unit of land, labor, and capital is used where it adds the greatest marginal returns to the farm business; thus, the farmer cannot change the distribution of a single unit of variable resource input without reducing farm income."

The principle of opportunity costs tells us that the cost of using a resource in one way is the return that would be obtained from using it in its most profitable alternative use. Such a cost is not deductible on income tax reports, but nonetheless is very important in making decisions in regard to highest net returns. If a farmer grows oats on a 40-acre field, he cannot grow corn there; if he works on the farm, he cannot work in town; if he invests money in machinery, he does not have it available for investing in fertilizer; if he invests money in a better feed, he does not have it available for investing in additional cows.

This principle has many applications and is very important in deciding where to invest capital for greatest returns. The assumption is made that capital as well as other resources is limited to the farmer when this principle is applied to farm production decisions.

1. Example--Comparative Net Returns from Three Alternative Uses of $2,000.

   (Use overhead projectual #13, "Comparative Net Returns from Three Alternative Uses of $2,000.)

   The following assumptions are made in the example:

   a. The dairy man can add some cows at very little if any additional cost for buildings, pasture, or labor.

   b. He has some cows in the 8,000 lb. level that he would like to replace with cows capable of producing about 11,000 lbs. of milk.

   c. He has only $2,000 to invest.

   Based on these assumptions, estimates of the additional net returns from each $500 invested in the three alternatives are shown in the example. In arriving at the net return from each additional $500 invested in grain, it is necessary to recognize the decreased response that can be expected from each added input of grain and the shifts that take place in the consumption of hay.

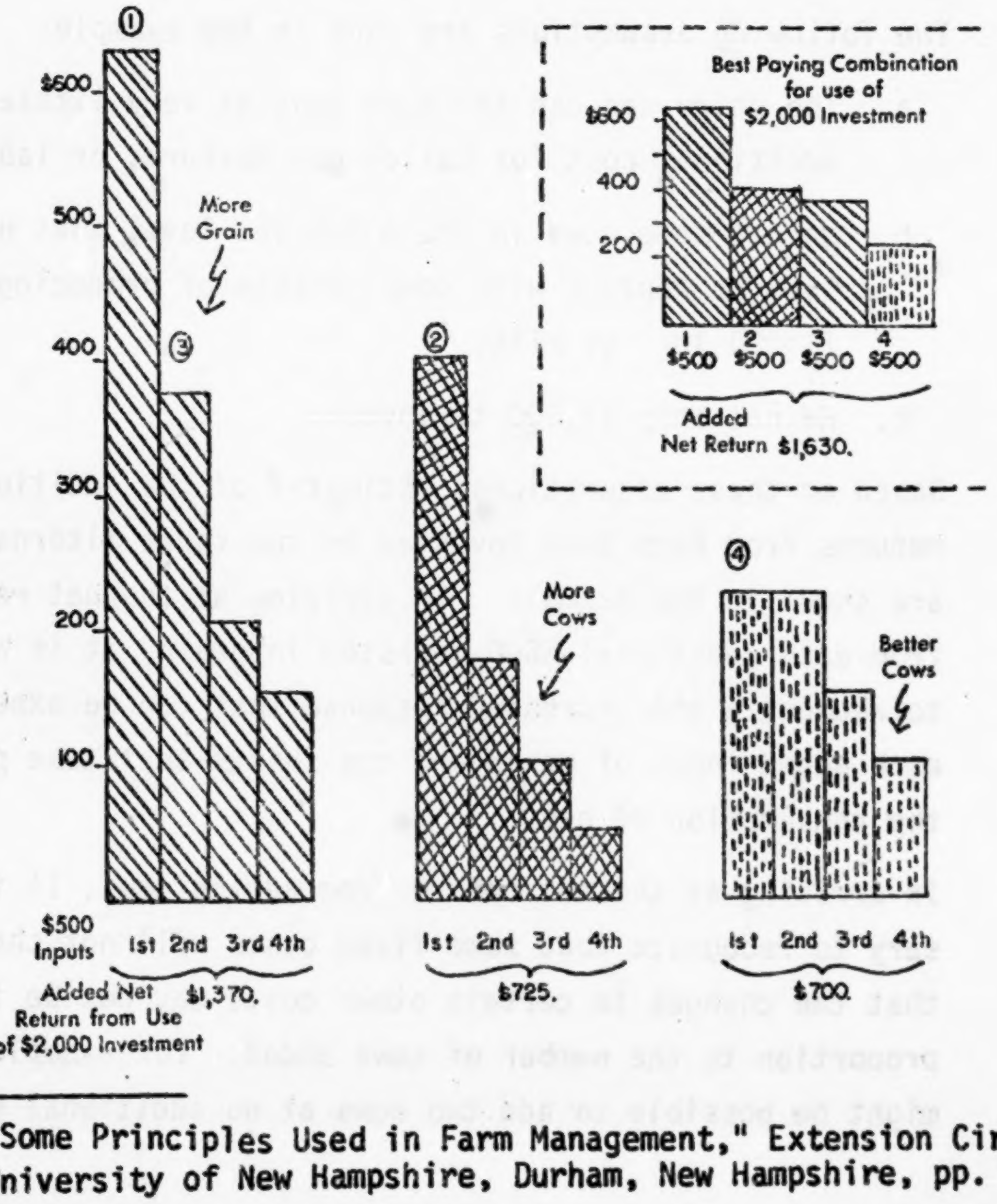
   In arriving at the net return from adding cows, it is necessary to recognize that some fixed costs will not change and that the changes in certain other costs may not be in direct proportion to the number of cows added. For example, it might be possible to add two cows at no additional expense

COMPARATIVE NET RETURNS FROM THREE ALTERNATIVE USES OF $2000

Input Number	Additional Investment	Additional Net Returns from: More Grain	More Cows	Better Cows
1st	500.00	$635.00	$400.00	$225.00
2nd	500.00	370.00	175.00	225.00
3rd	500.00	210.00	100.00	150.00
4th	500.00	165.00	50.00	100.00
	$2,000.00	$1,380.00	$725.00	$700.00

FIGURE 2.

COMPARATIVE NET RETURNS FROM THREE ALTERNATIVE USES OF $2000



Source: "Some Principles Used in Farm Management," Extension Circular 384, University of New Hampshire, Durham, New Hampshire, pp. 31-32.

Overhead Projectual #13

COMPARATIVE NET RETURNS

FROM THREE ALTERNATIVE USES OF $2,000

INPUT NUMBER	ADDITIONAL INVESTMENT	ADDITIONAL NET RETURNS FROM: MORE GRAIN	MORE COWS	BETTER COWS
1ST	$ 500	$ 635	$400	$225
2ND	500	370	175	225
3RD	500	210	100	150
4TH	500	165	50	100
	$2,000	$1,380	$725	$700

except for the direct cost of purchased grain and dairy supplies. Buildings, pasture, and labor are ample to take care of this addition. There will be a point, however, when any further addition will require additional building space, additional land, and additional labor. Consequently, as we add cows to the herd, it is logical to expect a diminishing return to occur at certain size intervals.

According to the procedure for locating best alternatives, the farmer should distribute limited funds among the different alternatives, beginning with the one which gives the highest net return per unit of input and continuing to the next highest paying input until the funds are exhausted.

Discussion Questions

(The answers are pointed out in Figure 2.)

1. Which alternative yields the greatest net return for the first $500 input? (more grain, $635)
2. Which alternative yields the greatest net return for the second $500 input? (added cows, $400) The third $500 input? (more grain, $370) The fourth $500 input? (better cows, $225
3. What is the total added return if the $2,000 is invested in this manner? ($1,630)

Conclusions

1. The highest possible net return has been secured for the $2,000 investment--$1,630. Any other distribution of $2,000 among the various alternatives would yield a lower net return despite the fact that all three alternative uses have positive net returns ranging from $1,370 to $700.
2. The example further illustrates the danger of making management conclusions based on analysis of only a single production activity. For example, it would pay

to spend all of the $2,000 on feed or all of it on more cows, or all on better cows, when each is considered separately. Yet no single one of these would yeild the greatest added net return over cost; therefore, they do not "Pay the most."

3. The example uses capital as the input, however, the principle applies to decisions involving land and labor also as it states, "The profit of a farm business will be greatest if each unit of land, labor, and capital is used where it adds the greatest marginal returns to the farm business, thus, the farmer cannot change the distribution of a single unit of variable resource input without reducing farm income."
4. The opportunity costs principle involves net or added returns; therefore, all additional costs and returns must be figured as each alternative is considered.

2. Example--Use of Capital

A farmer has an opportunity to invest his limited capital for additional fertilizer on 50 acres of corn or for spraying 50 acres of alfalfa with M + M (1 1/2 lbs. Methoxychlor + 1 1/4 lbs. Malathion) to aid in the control of the alfalfa weevil (a pest that is beginning to lower his hay yields).

As the farmer measures one of these practices against the other, he should ask himself, "Can the necessary investment for one practice be used more profitably in the other?"

(Use overhead projectual #14, "Use of Capital.")

Discussion Questions

1. Which alternative yields the greatest net return? (Alfalfa weevil control)
2. Which alternative yields the highest percent of net return per total investment? (alfalfa weevil control)
3. Which is more important when capital is limited, net return or percent of return on investment? (the latter)

USE OF CAPITAL

PROFIT ON FERTILIZER CHOICE

Returns	Expenses
10 Bu. Additional Yield/A On	100 # Of 10-20-20 @
50 A = 500 Bu. @ $1.32/Bu. = $660	$5 cwt On 50 A = $250

$660 (Return) - $250 (Expenses) = $410 Net Profit

$410 ÷ $250 = 164% Return On Investment

PROFIT ON ALFALFA WEEVIL CONTROL CHOICE

Returns	Expenses
.75 T Additional Yield/A On	M + M @ $5/A Applied;
50 A = 37.5 T @ $25 T = $937.50	On 50 A = $250

$937.50 (Return) - $250 (Expenses) = $687.50 Net Profit

$687 ÷ $250 = 275% Return On Investment

Source: Hypothetical situation.

4. When should the farmer choose both practices? (When capital is available for both. In this case, the farmer could afford to borrow money for both practices: alfalfa weevil control and fertilizer.)

5. Is it possible for an investment in a practice to have a greater net return but smaller return on investment than in another practice? (Yes)

Conclusions

1. When capital is limited, decisions must be made on percent of net return on investment and not on net returns.

2. Enterprises and practices usually require different amounts of investments and therefore the percent of return to investment will vary and should be calculated.

Additional Applications of the Principle

1. Should a young farmer with limited funds expand an existing stanchion barn or convert to a milking parlor arrangement?

2. Should a farmer with limited funds invest in a protein supplement for his dairy cows or a new crop variety?

3. Should a farmer with limited funds buy a new hay baler or have the hay custom baled and invest the money that he saved in additional dairy cows?

D. Profitable Enterprise Combinations

The problem of enterprise organization is one of finding the combination of crops or livestock which will give the greatest profit from a given investment. This is similar to the problem of practices which is mainly one of finding the combination of methods or resources which gives the lowest cost for any one output. The interrelationships between enterprises determines largely how far the farmer can go in combining one enterprise with another or in replacing one enterprise with another. Enterprises have the following relationships to each other: competitive, supplementary, and complementary.

1. Competitive Enterprise Relationship

Competing enterprises are those which compete for use of the farmer's resources. Most farmers have limited resources, and therefore, all crop and livestock enterprises become competitive at some point.

When enterprises are competitive, three factors determine the exact combination which is most profitable. (a) the rate at which one enterprise substitutes for another, (b) the prices of the products, and (c) the costs of producing the products.

If two crop enterprises have the same per acre costs, only the substitution rates and the prices of the products are important in deciding the best combination of the two.

If the two crops have different costs per acre, then the ratio of net prices must be compared with the substitution ratio. The net price is the market price per unit less the cost per unit.

Cash crops substitute for each other at a constant rate because an increase in acreage with one necessitates the same decrease in acreage with the other. When two crops or enterprises have constant substitution rates, profits are greatest if the farmer produces all of the most profitable enterprise and none of the other.

2. Supplementary Enterprise Relationship

Some enterprises supplement each other in the sense that they do not compete with each other and yet do not add directly to the production of each other (as do complementary enterprises).

A small poultry enterprise is supplementary to other enterprises on many farms. Up to some limits in size, it uses family labor, shelter already on hand, and perhaps even some feeds which would go to waste.

Hogs following cattle are supplementary for the grain they pick up in the manure and even for some labor. The family garden is another example of a supplementary enterprise. A supplementary enterprise, however, becomes competitive if it is expanded too far. If the poultry, hog, or garden enterprises are increased enough, they must eventually compete with major enterprises for feed, labor, and capital.

3. Complementary Enterprise Relationship

Some enterprises complement each other in that one adds to the production of the other. Alfalfa in the rotation normally increases the yields of a corn crop that follows. The legume hay crop adds nitrogen and organic matter to the soil. This is subsequently utilized by the corn. Complementary relationships exist between livestock enterprises on some farms. Occasionally, so many cattle are run on pasture that a maximum of livestock product is not being attained from a given acreage. Sale of some cows would result in better pasture management and the proceeds could be invested in other enterprises.

When the complementary enterprise is increased, it eventually becomes competitive.

Discussion Questions

1. What farm management principles should be used when selecting the most profitable combination of enterprises? (substitution and opportunity costs) Explain.
2. What is the relationship of an enterprise that is supplementary for labor and capital resources but competitive for land? (competitive)
3. What information must the farmer know in order to profitably combine his enterprises? (substitution rate, price of the product, production costs)
4. What are the relationships that enterprises have to one another? (competitive, supplementary, and complementary)

5. What are some examples of each of the relationships in Question 4?
6. Why does the choice of enterprises depend on the resources available? (principle of opportunity costs)

Conclusions

1. The available resources and the enterprise relationship determine the most profitable combination of crops and livestock.
2. There is a most profitable combination of enterprises for a given farm business and all other combinations will result in lower net returns.
3. The principle of opportunity costs and substitution should be used when choosing between competitive enterprises.
4. Whenever the enterprises compete for one important resource, even though they are supplementary for the others, the final relationship is one of competition.
5. Maximum returns are achieved when the returns to the most limiting resource are greatest.
6. Supplementary and complementary enterprises only need to have greater returns than their costs to be included in the profitable combination of enterprises.

E. Summary--Using Farm Management Principles When Making Decisions

The major objective of the three preceeding instructional units is "to enable young farmers to improve their ability to use farm management principles and concepts when making decisions." The farmer who has the best understanding of farm management principles and knows how to apply them to his farm business decisions is the most successful. The principles and concepts of farm management that are illustrated in these units are vital in the process of decision making.

Goals determine the desired income which in turn determines the desired production which ultimately determines the the changes (decisions) to be made. Goals have a direct relationship with the number and kind of decisions that the young farmer makes.

(Use overhead projectual #4, "Relationship of Goals to Changes.")

Wise decision making involves wise use of the resources that are available to the young farmer and wise use of the resources involves the use of farm management principles and concepts.

Three of the major farm management principles can be converted by the young farmer to three questions.

(Use overhead projectual #5, "Can You Answer Yes?")

1. Will it pay?--Diminishing Returns Principle.
2. Will it return more than other alternative practices or uses of resources?--Substitution Principle.
3. Is this the most profitable alternative use of the investment? - Opportunity Costs

If the farmer can answer yes to these questions, he should make the proposed change.

The other farm management concepts that are important to decision making are the fixed-variable cost relationship and the selection of the most profitable combination of enterprises.

Wise decision making, of course, involves more than just the use of farm management principles and concepts. The farmer needs good production records in order to be able to identify his costs and returns. An analysis of his farm records also reveals any weak areas in his farm business. Good farm management also involves the planning and budgeting of the farm resources.

F. References

Substitution Principle

Agricultural Business Management--Principles that Affect Production. VAS 2040, Vocational Agricultural Service, College of Agriculture, University of Illinois, Urbana, Illinois, pp. 15-21.

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Some Principles Used in Farm Management Decision Making. Extension Circular 384, University of New Hampshire, Durham, New Hampshire, 1966, pp. 41-42.

Opportunity Costs Principle

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Profitable Enterprise Combinations

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APPENDIX B

INDIVIDUALS AND SCHOOLS CONNECTED WITH THE STUDY

Jury of Consultants for the Development of the Instructional Units

1. Dr. Joe P. Bail, Chairman, Division of Agricultural Education, Cornell University.
2. Dr. Richard L. Barker, Director, Research Coordinating Unit, University of New Hampshire.
3. Dr. C. Arthur Bratton, Professor, Farm Management, Department of Agricultural Economics, Cornell University.
4. Dr. William E. Drake, Professor, Division of Agricultural Education, Cornell University.
5. Dr. Milo J. Peterson, Chairman, Department of Agricultural Education, University of Minnesota.
6. Dr. Philip Teske, Specialist, Instructional Materials Practices Branch, Division of Comprehensive and Vocational Education Research, United States Office of Education.
7. Mr. Lyle L. Wicks, Instructional Materials Specialist, Division of Agricultural Education, Cornell University.
8. Mr. Charles S. Wiggins, Associate, Agricultural Education Bureau, New York State Education Department.

Participating Teachers

1. Mr. Bruce Bonesteel, Lowville Occupational Center
2. Mr. Durwood Carman, Madison Central School
3. Mr. James Eggleston, Harpursville Central School
4. Mr. Raymond Ernenwein, Kendall Central School
5. Mr. Philip Fredenburg, Indian River Central School
6. Mr. Warren Giles, Penn Yan Academy
7. Mr. Norman Goodrich, Verona BOCES
8. Mr. George Halloran, Hamilton Central School
9. Mr. Floyd Harwood, Argyle BOCES
10. Mr. James Huxtable, West Winfield Central School
11. Mr. Harry Karpiak, Salem Central School

12. Mr. Martin Lawrence, Northern Catskills Occupational Center
13. Mr. Kyle Morse, Chautauqua Central School
14. Mr. Gary Nieskes, Phelps High School
15. Mr. Richard Rawson, Falconer Central School
16. Mr. Donald Robinson Sr., Letchworth Central School
17. Mr. James Rose, Cherry Valley Central School
18. Mr. Harold Scheffler, Groton Central School
19. Mr. James Schiebel, Hilton Central School
20. Mr. Francis Waite, West Valley Central School
21. Mr. John Weber, Hermon-DeKalb Central School

Participating Schools by Treatment Group

Experimental Group A

1. Occupational Center, Lowville, New York
2. Madison Central School, Madison, New York
3. Indian River Central School, Philadelphia, New York
4. BOCES, Verona, New York
5. Hamilton Central School, Hamilton, New York
6. West Winfield Central School, West Winfield, New York
7. Hermon-DeKalb Central School, DeKalb, New York

Experimental Group B

8. Harpursville Central School, Harpursville, New York
9. Kendall Central School, Kendall, New York
10. Penn Yan Academy, Penn Yan, New York
11. Northern Catskills Occupational Center, Grand Gorge, New York
12. Phelps High School, Phelps, New York
13. Hilton Central School, Hilton, New York

Control Group C

14. BOCES, Argyle, New York
15. Salem Central School, Salem, New York
16. Chautauqua Central School, Chautauqua, New York
17. Falconer Central School, Falconer, New York
18. Letchworth Central School, Gainesville, New York
19. Cherry Valley Central School, Cherry Valley, New York
20. Groton Central School, Groton, New York
21. West Valley Central School, West Valley, New York

APPENDIX C

CORRESPONDENCE

NEW YORK STATE COLLEGE OF AGRICULTURE
A STATUTORY COLLEGE OF THE STATE UNIVERSITY
CORNELL UNIVERSITY
ITHACA, N. Y. 14850

DEPARTMENT OF EDUCATION
STONE HALL

10 October 1968

The Division of Agricultural Education and the U. S. Office of Education are presently cooperating in a study of farm management instruction offered to young farmers in New York. This project, with Professor W. E. Drake as Director and Harry E. Peirce as Principal Investigator, is designed to achieve two objectives:

1. To determine the nature of instruction and methods used in teaching farm management to young farmers.
2. To develop and test instructional units that vo-ag teachers can use that will enable young farmers to improve their ability to use farm management principles when making decisions.

The initial phase of this project relates to the first objective. The following steps will be followed in order to achieve this objective:

1. Selection of schools that will participate in the project.
2. Visit to participating schools by Harry Peirce to discuss methods of young farmer instruction in farm management.
3. Following a period of farm management instruction to young farmers, the cooperating teacher will administer a multiple choice quiz based on farm management decisions. Each teacher, as a participant of the project, will receive $10 for administering the quiz.
4. The quizzes will be forwarded to Cornell for grading and tabulating.

The success of this project, as is always the case, is dependent on the willingness and cooperation of the teachers. I feel that the objectives are worthwhile and that the resulting instructional units will be beneficial not only to New York teachers, but to teachers in other states as well. Will you please complete and return the enclosed card to aid us in selecting the participating schools?

I sincerely hope you will be willing to cooperate in this study along with your fellow teachers of agriculture.

Sincerely yours,

Joe P. Bail
Professor and Chairman
Agricultural Education Division

Enclosure

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CORNELL UNIVERSITY
ITHACA, N. Y. 14850

DEPARTMENT OF EDUCATION
STONE HALL

24 October 1968

Your interest in the Cornell study of farm management instruction offered to young farmers in New York is sincerely appreciated. You were one of the many teachers who enthusiastically responded to our call for assistance in this study.

Great care has been taken in selecting appropriate schools, including yours, to carry out the task of achieving the objectives of this study. Various members of the Cornell Division of Agricultural Education and the Department of Agricultural Economics have been diligently working on this study and the U. S. Office of Education has deemed it worthy of a federal grant. However, the ultimate success of the study depends on the cooperation of the agriculture teachers.

I am lookind forward to visiting your school in the near future in order to discuss with you the various methods of farm management instruction. Would you please fill out and return the enclosed card in order to facilitate my visit to your school?

Sincerely yours,

Harry E. Peirce
Research Assistant

Enclosure

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CORNELL UNIVERSITY
ITHACA, N. Y. 14850

DEPARTMENT OF EDUCATION
STONE HALL

8 November 1968

The Cornell study of farm management instruction offered to young farmers is progressing a little faster than anticipated. We have prepared three instructional units titled "Using Farm Management Principles When Making Decisions."

These units are designed for young farmer classes and we have decided to offer them to a selected group of teachers this fall for field testing. We are offering these units to you and hope that you will consent to use them in three of your subsequent young farmer meetings. These units will be revised following the field testing and made available to all teachers next year.

The field testing of these units involves the following procedures:

1. Instructional meeting for teachers using the farm management units. (November 18 at Lowville)
2. Visit to your school by myself to discuss your methods of farm management instruction.
3. Following the period of farm management instruction the teacher will administer a multiple choice quiz based on farm management decisions. The quizzes will be forwarded to Cornell for grading and tabulating.
4. Teachers using the units will be requested to fill out a unit appraisal questionnaire upon completion of the instructional units.
5. There will be a unit appraisal meeting with the teachers upon the completion of the teaching of the units. (probably February or March)

Cooperating teachers will be compensated in the following manner:

1. Each teacher, as a participant of the project, will receive $10 for administering the quiz.
2. Each teacher will be reimbursed $.06 a mile for travel to each of the two meetings.
3. Each teacher will be reimbursed $15.50 a day per diem for travel to each of the two meetings.

I fully expect that the instructional units will be beneficial to you this year and that the results of the field testing will subsequently improve the units and therefore benefit all the teachers next year.

I am enclosing a copy of the instructional unit outline. Included in the units are 14 overhead projectuals to be used to illustrate examples that show how and when farm management principles are used when making decisions.

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DEPARTMENT OF EDUCATION
STONE HALL

8 November 1968

Page 2

The references listed at the end of each unit should prove very useful to you as you make preparations for teaching these units. I particularly found the following very useful: Barker's Profit-Maximizing Principles, Heady and Jensen's Farm Management Economics and the two bulletins from Illinois and New Hampshire. Barker's teaching units cost $2.00 and you can order them from Lyle Wicks Instructional Materials Service here at Cornell.

We have scheduled a meeting with the vocational agriculture teachers who will be using the instructional units at Lowville on Monday, November 18 at 6 p.m. We will have dinner and then either meet where we eat or adjourn to the high school. Exact details of the meeting will be forwarded to you soon. Lyle Wicks, Instructional Materials Specialist will participate in this meeting. We still want you to use the units even though the November 18 meeting may be inconvenient for you to attend.

I sincerely hope that you will decide to use these units in your young farmer classes this fall and winter. The units with the 14 overhead projectuals are rather bulky and expensive so I will delay mailing them to you until I receive your confirmation on the enclosed card. If you don't intend to use them until after our meeting on November 18, you may indicate this on the card and you can pick them up at the meeting.

Sincerely yours,

Harry E. Peirce
Research Assistant

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DEPARTMENT OF EDUCATION
STONE HALL

23 December 1968

The Cornell study of farm management instruction offered to young farmers is proceeding according to schedule. We are pleased that your school is participating in this project by field testing the prepared instructional units.

An early indication reveals that the units are being well received by the teachers and young farmers. The first questionnaires that have been returned also include suggestions for improvement. This cooperative spirit should result in an improved revised final product.

I have been able to visit many of the schools in the project already and expect to complete these visits in January.

The unit appraisal questionnaires and the farm management quiz are essential in field testing these instructional units. It is very important that the instructions be carefully followed in order to secure an accurate appraisal.

It appears that the quiz and questionnaire can be administered at the third meeting following the instruction. If time is limited, however, this could be done at the next meeting. Please use the enclosed post card to let me know when you expect to complete the farm management instructional units and how many young farmers will be taking the quiz. I will send the quizzes and questionnaires prior to the date that you will need them.

The instructional units are designed for three meetings, however, feel free to move ahead to the next unit if you complete a unit in less time than anticipated.

Please make two corrections in unit 2 in case you haven't done so already. The answer to the first discussion question on page 18 should be 80 pounds instead of 40 pounds. The answer to the second discussion question on page 20 should also be 80 pounds for $4.

Please let me know if you have any problems or questions regarding the field testing of the units.

Sincerely yours,

Harry E. Peirce
Research Assistant

Enclosure

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DEPARTMENT OF EDUCATION
STONE HALL

23 December 1968

The Cornell study of farm management instruction offered to young farmers is proceeding according to schedule. We are pleased that your school is participating in this project.

I have been able to visit many of the schools in the project already and expect to complete these visits in January.

The objective of the initial phase of this project, as related in Dr. Bail's letter, is to determine the nature of instruction and methods used in teaching farm management to young farmers. Two steps are being taken in order to achieve this objective.

1. Visit to the participating schools by myself to discuss methods of young farmer instruction in farm management.
2. Following a period of farm management instruction to young farmers, the cooperating teacher will be asked to administer a 39 question, multiple choice quiz based on farm management decisions.

Would you please use the enclosed card to let me know when you expect to complete your farm management instruction and how many quizzes you will need in order that these can be forwarded to you in ample time.

Thank you very much for your cooperation.

Sincerely yours,

Harry E. Peirce
Research Assistant

Enclosure

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DEPARTMENT OF EDUCATION
STONE HALL

24 February 1969

The Cornell study of farm management instruction offered to young farmers is progressing according to schedule. The field testing of the instructional units should be completed by the end of March.

I am very pleased with the reception that these units have received and of the splendid cooperation on the part of the agriculture teachers. The next phase of this study calls for the teacher's instructional unit appraisal meeting to be held at Cornell. The purpose of this meeting is to receive the reaction of the teachers, as a group, to the units so that they may be revised and made more effective.

Teachers will be reimbursed for their expenses while attending this meeting at the following rate: $.06 a mile for travel; $1.50 for breakfast; $1.65 for lunch; $4.35 for dinner, and $9.00 for lodging ($16.50 per day). Your expense check will also include the $10.00 for administering the quiz.

We are attempting to set the date for the unit appraisal meeting at a time that will be most convenient for the majority of the cooperating teachers. Please indicate on the enclosed card your preference for the date of this meeting and return it promptly. You will be notified immediately the date of the meeting.

Thank you very much for your cooperation.

Sincerely,

Harry E. Peirce

HEP:br
Enclosure

NEW YORK STATE COLLEGE OF AGRICULTURE
A STATUTORY COLLEGE OF THE STATE UNIVERSITY
CORNELL UNIVERSITY
ITHACA, N. Y. 14850

DEPARTMENT OF EDUCATION
STONE HALL

18 March 1969

The Cornell Young Farmer Farm Management Project is approaching its final phase. This phase includes the analysis of data that have been collected and the revision of the instructional units.

The quiz answer sheets and questionnaires have been arriving regularly and I urge you to forward these to me as soon as they are completed if you have not already done so.

The instructional unit evaluation and revision meeting will be held in the Conference room of Stone Hall at Cornell on Saturday, April 19. The meeting will start at 10 a.m. with coffee, etc. at 9:30 a.m. and will conclude by 4:00 p.m. You will be reimbursed for your transportation, housing and meals.

This will be the only opportunity you will have to share your reactions with the other teachers in this project. The revised units will be made available to all agriculture teachers in New York and are probably the most important end product of this study. I hope that you will make sincere effort to attend this meeting as these units will be revised according to the suggestions of this group.

Enclosed is a list of all the teachers who used the farm management instructional units, in case you may want to share a ride to the evaluation and revision meeting.

Dr. Drake and I are looking forward to this meeting.

Sincerely yours,

Harry E. Peirce
Research Assistant

HEP:br
Enclosure

APPENDIX D

DATA GATHERING INSTRUMENTS

MULTIPLE CHOICE QUESTIONS ON FARMING

INSTRUCTIONS

Place your name and school on the answer sheet, NOT on the test. Each problem in the test includes a statement followed by several possible answers labeled a, b, c, d. The letters a, b, c, d in the test correspond with the numbers 1, 2, 3, 4 on the answer sheet. Read each question and its letter labeled answer. When you have decided which answer is best, blacken the corresponding numbered space on the answer sheet with pen or penicl. Make your mark as long as the pair of lines. If you change your mind, erase your first mark completely or circle it and mark another. (Note: these tests will NOT be machine graded) Answer all questions. Read each question and each possible answer carefully before selecting your choice. Only one answer is considered the best.

Example

QUESTION: For a farm operator who is heavily in debt, the most important factor to consider in choosing enterprises to combine into a farm business is:

_____a. personal preference

_____b. labor distribution

_____c. relative profit per unit of investment as compared with competing enterprises.

_____d. capital necessary to begin new enterprises.

c. is considered the best answer, therefore, number 3 on the answer sheet would be blackened.

Calculations, if needed, can be made on the back of the answer sheet.

QUESTION: (1) A farmer is told that he can obtain an increase in daily gain of feeder pigs by the addition of one-half pound of protein supplement placed in the daily ration. He thinks this is good and, therefore, adds 1# of protein supplement to the daily ration. Which of the following results is most likely to occur?

_____a. daily gain per head will be doubled.
_____b. daily gain per head will remain the same.
_____c. daily gain per head will increase but not double.
_____d. daily gain will actually decrease.

QUESTION: (2) A farmer is able to produce 70 bushels of oats per acre with the application of 100# commercial fertilizer per acre. By varying only one factor of production, in this case, the amount of fertilizer applied, he can receive a yield increase of 12 bushels per acre with the application of 200# of additional commercial fertilizer. A 300# increase in fertilizer would result in an additional yield increase of 6 bushels per acre and a 400# increase in an additional yield of 2 bushels per acre. If oats will sell for 80¢ per bushel and the fertilizer costs $4.00 per hundred, how much fertilizer should be applied to maximize his net income?

_____a. 100#
_____b. 300#
_____c. 400#
_____d. 500#

QUESTION: (3) Purchasing a larger piece of machinery in order to reduce the cost required to complete a particular operation is feasible if:

_____a. the savings in labor is less than the cost of owning the larger machine.
_____b. there is sufficient capital available.
_____c. the savings in labor is equal to the cost of owning the larger machine.
_____d. the value of labor saved is greater than the cost of owning the larger machine.

QUESTION: (4) Up to harvest time a farmer has spent $10 per acre for labor, seed, and machine costs on oats. Price of oats has fallen, and a severe local drought has reduced his yields. With an anticipated price of 70¢ per bushel on an expected yield of 10 bushels per acre, the farmer cannot expect to make a profit on this crop. Assuming that the oats crop can be harvested for $3 per acre, the farmer should:

_____a. assume his $10 loss for the year and leave the oats in the field.
_____b. harvest the oats crop.
_____c. sell the oats crop as pasture for $2 per acre.
_____d. sell the oats crop for hay at $3 per acre.

QUESTION: (5) Assuming a farmer with limited capital can get $4 return for each of $1 invested in protein supplement for hogs, he should invest his limited funds in a new crop variety if:

_____a. net profit on the crop is increased.
_____b. investments in new varieties return at least $4 for $1 of added costs.
_____c. investments in new varieties return more to net profit than investments in protein for hogs.
_____d. investments in new varieties increase yields per acre, crop quality and total farm gross income.

QUESTION: (6) On a large cash grain and hay farm where summer labor is limited, which one of the following enterprises would fit in the best, providing adequate facilities and equipment exist?

_____a. sheep
_____b. cattle feeding
_____c. hog feeding
_____d. laying hens

QUESTION: (7) Referring to the table below, which level of fertilizer application would yield the most return to the farmer per $1 invested in fertilizer:

Quality of Fertilizer Added	Total Yield	Cost of Added Fertilizer	Value of Added Yield
0#	60 bushels	$ -	$ -
10#	65 bushels	1.50	4.50
20#	68 bushels	1.50	2.70
30#	70 bushels	1.50	1.80
40#	71 bushels	1.50	.90

_____a. 10#
_____b. 20#
_____c. 30#
_____d. 40#

QUESTION: (8) Assuming that 100# of pork can be produced either with 340# corn and 15# soybean meal or with 270# corn and 40# soybean meal, which item below would be the most important for the farmer to consider before he makes the decision regarding which combination to feed?

_____a. the price of soybean meal per pound
_____b. the price of corn per pound
_____c. the price of hogs per hundredweight
_____d. the price of corn and soybean meal per pound

QUESTION: (9) Referring to fixed costs such as insurance and taxes and variable costs such as seed, feed, and fertilizer as they relate to the farm business, which of the following costs must be paid by the farmer even if nothing is produced?

_____a. both variable and fixed costs
_____b. variable cost
_____c. fixed costs
_____d. neither variable nor fixed costs

QUESTION: (10) Based on the "Return Per $100 Investment" table below, a farmer with $1000 capital to invest in his farm business should invest the most in:

Returns Per $100 Investment

Capital	Bonds	Building	Machinery	Dairy Equipment
1st $100	$104	$155	$158	$170
2nd $100	104	148	143	160
3rd $100	104	136	139	151
4th $100	104	115	135	140
5th $100	104	100	130	136

_____a. bonds
_____b. buildings
_____c. machinery
_____d. dairy equipment

QUESTION: (11) A dairyman is milking an average of 40 head of dairy cows monthly and is not utilizing his good hired man effeciently during the winter. He has a large poultry house which is not being used presently and has, also, a surplus of corn. What should he do?

_____a. expand his dairy herd
_____b. custom hire his corn production
_____c. buy 50 to 100 feeder pigs in late fall to feed out each winter
_____d. sell the surplus corn and let the hired man rest some in the winter

QUESTION: (12) With a capital investment of $5000, a farmer could install an automatic feeding system for his dairy cows. It is estimated that this system would save approximately 300 hours of chore labor per year. In order for the farmer to make a sound decision on whether or not to invest in this system, he would need to consider which of the following:

_____a. the possible return on the $5000 if invested elsewhere in the farm business.
_____b. whether the labor saved could be profitably utilized elsewhere in the farm business.
_____c. the annual fixed and variable costs for operating and maintaining the new feeding system.
_____d. all of the above.

QUESTION: (13) A farmer has an average fixed cost of $12 per acre on land planted to corn. Assuming that the variable cost required to produce 1 bushel of corn remains the same, if the farmer increases corn production per acre, he will:

_____a. lower the per bushel cost of producing corn.
_____b. increase the per bushel cost of producing corn.
_____c. not affect the per bushel cost of producing corn.
_____d. decrease the variable costs per bushel of corn.

QUESTION: (14) A farmer has $1600 to invest in his farm business. He is presently raising 100 acres of small grain and has been harvesting with his own combine but the combine needs to be replaced. The cost of harvesting with his own combine is $3 per acre while custom conbining costs $4 per acre. He can save $100 each year by doing his own combining, If the present combine can be replaced for $1600, the $100 saved by doing his own harvesting is about 6% return on his investment. If the $1600 were invested in dairy cows, it would return $200 above costs; what should the farmer do?

_____a. replace the combine and continue harvesting small grain because he saves $100 per year.
_____b. invest the money in dairy cows and hire the combining done.
_____c. plant more acres of small grain in order to reduce fixed costs on the combine.
_____d. invest in a smaller combine which would still get the harvesting done efficiently.

QUESTION: (15) A supplementary enterprise such as hogs following steers in a feed lot does:

_____a. compete with another enterprise but also adds directly to the production of that enterprise

_____b. compete with other enterprises without adding to their production

_____c. add directly to the productivity of another enterprise

_____d. neither compete with nor add to the production of another enterprise, yet increases the net farm income

QUESTION: (16) Feeding trials have indicated that the first 50# of pork can be produced with 150# of feed; the second 50# of pork with 200# of feed; and the third 50# of pork with 175# of feed. Therefore, a farmer who feeds out hogs:

_____a. can expect less added gain from each additional pound of feed fed to hogs being fattened

_____b. can expect more feed efficiency as hogs approach market weight

_____c. can produce the fourth 50# of pork for 300# of feed,

_____d. can expect all of the above

QUESTION: (17) When a farmer increases his investment in land, buildings, and equipment without increasing the total units of production, the cost per unit of production:

_____a. decreases

_____b. increases

_____c. remains the same

_____d. varies with the operator

QUESTION: (18) Based on the "Return to Investment" table below, if a farmer had $400 to invest in his present farming business, how much should be invest in machinery for maximum net farm income?

Returns Per $100 Investment

Capital	Hog Equipment	Machinery	Dairy Cows
1st $100	$155	$158	$170
2nd $100	148	143	160
3rd $100	136	139	151
4th $100	115	135	140

_____a. $100

_____b. $200

_____c. $300

_____d. $400

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QUESTION: (19) Competing enterprises are those which compete with one another for the use of a farmer's resources; if one enterprise is increased, the one enterprise decreases. Therefore, all enterprises:

_____a. become competitive at some point.
_____b. never become completely competitive.
_____c. become helpful to each other at some point.
_____d. should be considered as separate business ventures.

QUESTION: (20) An 8# ration of cracked corn and sufficient roughage and protein supplement fed daily to an 800# steer will yield a 2# daily gain in weight. If the amount of cracked corn is increased to 16# per day with sufficient roughage and protein supplement added to balance the ration, the daily gain will now most likely be:

_____a. twice that of the 8# ration of cracked corn.
_____b. less than the 8# ration of cracked corn.
_____c. More than the 8# ration of cracked corn.
_____d. more than twice that of the 8# ration of cracked corn.

QUESTION: (21) To secure maximum profit through increased milk production, a dairyman should increase the daily ration fed dairy cows until the cost of the additional feed is:

_____a. greater than the value of the increased milk production.
_____b. Less than the value of the increased milk production.
_____c. equal to the value of the increased milk production.
_____d. one-half the value of the increased milk production.

QUESTION: (22) If 1# of soybean meal will substitute for 1.2# of linseed meal of equal nutritional value and soybean meal sells for 5.2¢ per pound and linseed meal sells for 4¢ per pound, the livestock farmer who wishes to make the largest net income should:

_____a. feed 68% soybean meal and 32% linseed meal.
_____b. feed all soybean meal.
_____c. feed 20% soybean meal and 80% linseed meal.
_____d. feed all linseed meal.

QUESTION: (23) A farmer's profit will be greatest if each unit of land, labor, and capital is used:

_____a. in such a manner that it will add the most to gross returns of the farm business.
_____b. on the enterprise in which the farmer has the greatest interest and ability.
_____c. on the enterprises where he will realize the greatest yield per acre or animal unit.
_____d. in such a manner that will add the most to net returns of the farm business.

QUESTION: (24) Combining crop enterprises to reduce uncertainty is advantageous particularly for:

_____a. the beginning farmer with ample capital.
_____b. a tenant farmer with specialized machinery.
_____c. a farmer with unlimited capital.
_____d. a farmer with limited capital.

QUESTION: (25) A 4-plow gasoline tractor burns 4 gallons of fuel per hour, and a 4-plow diesel tractor burns 3 gallons of fuel per hour. A farmer should consider purchasing a diesel tractor if:

_____a. the annual fuel costs are less for the diesel.
_____b. the annual savings in fuel costs will be more than the additional annual cost of owning the diesel tractor.
_____c. the annual savings in fuel costs will equal the total costs incurred in owning the gasoline tractor.
_____d. the rate of operation per acre is the same with the diesel as the rate for the gasoline tractor.

QUESTION: (26) A farmer has been feeding cattle on his 300-acre farm since 1955 with the help of an up-to-date set of machinery and a good full-time hired man. He has always fed out 75 head of calves and 50 head of yearlings per year. Over the last 5 years he has invested $15,000 in his cattle feeding operation for buildings and modern feeding equipment. His net income has decreased even with the addition of efficient feeding facilities and he cannot understand why. Can you explain the reason?

_____a. cattle feeders can expect losses for several years in a row.
_____b. he should have fed out all yearlings.
_____c. he has increased overhead costs without changing his volume of business.
_____d. he made the wrong choice of enterprises as dairying is a better enterprise.

QUESTION: (27) By diversifying crop enterprises rather than specializing in one major crop, the crop farmer will:

_____a. reduce risk and uncertainty.
_____b. decrease annual labor efficiency.
_____c. facilitate the use of more labor saving equipment.
_____d. concentrate production knowledge.

QUESTION: (28) Assuming all other production factors are of no influence, the fertility of a given field is sufficient to produce 80 bushels of corn per acre without additional nitrogen. The addition of 10# of available nitrogen to one acre of the above land will increase the yield 10 bushels per acre. If a second 10# of available nitrogen is applied to the same land, the yield per acre will most likely:

_____a. increase the same number of bushels per acre as the first 10# of available nitrogen applied.
_____b. increase less bushels per acre than the first 10# of available nitrogen applied.
_____c. increase more bushels per acre than the first 10# of available nitrogrn applied.
_____d. not be affected by the additional 10# of available nitrogen applied.

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QUESTION: (29) Based on the table below showing the yield at different levels of nitrogen used per acre of wheat, which statement is most nearly correct?

No. of Lbs. of Nitrogen Added	Total Yield Per Acre
0	30 bushels
10	38 bushels
20	42 bushels
30	44 bushels
40	45 bushels

_____a. the bushels added to the total yield by each successive 10# of additional nitrogen increase at a uniform rate.
_____b. the bushels added to the total yield by each successive 10# of additional nitrogen increase at a diminishing rate.
_____c. the bushels added to the total yield are greatest at the 20# level.
_____d. the 40# rate will yield the best return on a farmer's investment in fertilizer.

QUESTION: (30) Commercial fertilizer should be applied to crops as long as:
_____a. the added production returns increase gross farm income.
_____b. the added fertilizer maintains soil productivity.
_____c. the added production returns are more than the added cost of the fertilizer.
_____d. the added fertilizer increases crop yields per acre.

QUESTION: (31) An approved practice for increasing the per acre yield of soybeans has been discovered and tested at the State Experimental Station. A farmer should adopt the new practice if:
_____a. it will improve the quality of soybeans.
_____b. it will increase soybean receipts more than expenses.
_____c. it will increase the size or volume of the farm business.
_____d. it will increase gross farm income.

QUESTION: (32) For maximum net returns, a farmer should substitute machinery for labor when:
_____a. the annual cost of machine use is equal to the cost of labor.
_____b. the value of labor saved is more than the annual cost of machine use.
_____c. there is a limited supply of labor.
_____d. the additional machine will increase labor efficiency.

QUESTION: (33) In analyzing the farm business, depreciation should be considered as:
_____a. a variable cost.
_____b. a fixed cost.
_____c. an opportunity cost.
_____d. an operating cost.

QUESTION: (34) A farmer can borrow only $400 for chemicals to control weeds on 100 acres of corn, 100 acres of wheat, and 100 acres of barley. Previous weed control trials have indicated that he can expect the following returns per $1 invested in chemicals:

Return Per Additional $1 of Chemicals

	Corn	Wheat	Barley
1st $100	$2.50	$1.50	$1.25
2nd $100	2.25	1.25	1.00
3rd $100	1.75	.75	.50
4th $100	1.25	.50	.25

He should:
_____a. put all $400 worth on corn.
_____b. put $300 on corn and $100 on wheat.
_____c. put $200 on corn and $200 on wheat.
_____d. distribute it evenly over all these crops.

QUESTION: (35) The normal seeding rate for barley is 90# per acre. Two fields with comparable capability and fertility levels are seeded to barley. Field "A" is seeded at the rate of 115# per acre and Field "B" is seeded at the rate of 140# per acre. Assuming that growing conditions were identical for each field, we might predict that the yield per acre of Field "B" would be:
_____a. twice the yield of Field "A".
_____b. the same yield as Field "A".
_____c. less than the yield of Field "A".
_____d. more than the yield of Field "A".

QUESTION: (36) It is profitable for a farmer to borrow money to expand his farm business when the borrowed money:
_____a. returns more than the cost of borrowing money.
_____b. can be secured at a low interest rate.
_____c. can improve the level of production.
_____d. will increase volume of business.

QUESTION: (37) A hog raiser should substitute barley for corn in a ration as long as:
_____a. barley is 80¢ per bushel and corn is $1 per bushel.
_____b. barley and corn substitute at the same rate of total digestible nutrients.
_____c. the value of the corn replaced is less than the cost of the barley added.
_____d. the value of the corn replaced is more than the cost of the barley added.

QUESTION: (38) In the long run, usually 15-20 years, all costs encountered in operating a farm business become:

_____a. variable costs.
_____b. fixed costs.
_____c. submarginal.
_____d. capital costs.

QUESTION: (39) Assuming that a farmer is efficiently managing his farm business, the last dollar spent on a factor of production, such as seed, fertilizer, machinery, or buildings, will yield a marginal or added return:

_____a. greater than the last dollar earned from all other factors of production.
_____b. exactly equal to the last dollar earned from all other factors of production.
_____c. less than the last dollar earned from all other factors of production.
_____d. twice as large as the last dollar earned from all other factors of production.

Teacher's Reaction to Farm Management Instructional Units

Note to Teachers: Your reaction and suggestions will be taken into consideration when these units are revised. Please read the questions carefully and answer them according to your honest opinion. You will also have an opportunity to voice your opinion at a teacher's evaluation meeting held after all the teachers have completed the units.

Use the following criteria for answering questions 1 through 9.

Very Useful - I feel that this approach is very effective and will continue to use it in my young farmer program.

Useful - I feel that this approach is useful and consider using it again in the future.

Some Value - I feel that this approach has some value and consider using some aspects of it in the future.

Little or No Value - I feel that this approach has little or no value and do not consider using it again.

1. What is your general reaction to the approach used in the three farm management instructional units?

Very Useful ______
Useful ______
Some Value ______
Little or No Value ______

2. What is your reaction to the first unit on the relationship of goals to decision making?

Very Useful ______
Useful ______
Some Value ______
Little or No Value ______

3. What is your reaction to the section in the second unit on the principle of diminishing returns?

Very Useful ______
Useful ______
Some Value ______
Little or No Value ______

4. What is your reaction to the section in the second unit on the fixed-variable cost relationship?

Very Useful ______
Useful ______
Some Value ______
Little or No Value ______

5. What is your reaction to the section in the third unit on the principle of substitution?

Very Useful ______
Useful ______
Some Value ______
Little or No Value ______

6. What is your reaction to the section in the third unit on the principle of opportunity costs?

Very Useful ______
Useful ______
Some Value ______
Little or No Value ______

7. What is your reaction to the section in the third unit on profitable enterprise relationships?

Very Useful ______
Useful ______
Some Value ______
Little or No Value ______

8. How useful do you believe the examples were that were used to illustrate the principles and concepts?

Very Useful ______
Useful ______
Some Value ______
Little or No Value ______

9. How useful do you believe the overhead transparencies were?

Very Useful ______
Useful ______
Some Value ______
Little or No Value ______

10. What examples that were used would you remove, improve or substitute?

11. What overhead transparencies that were used would you remove, improve or substitute?

12. What do you believe are the two greatest weaknesses of these units?

13. What do you believe are the two greatest strengths of these units?

14. What changes do you believe would improve these units?

15. Other comments.

Teacher's Supplemental Questionnaire

Name ________________ School ________________

This information is requested in order to determine the relationship (if any) between certain independent variables and the young farmers' understanding of farm management principles as measured by their quiz scores.

Personal Data

1. Age? _______.
2. Years of teaching vocational agriculture? ________.
3. Years of teaching young farmers? _________.
4. College semester hours of economics instruction received? _________.
5. Master's degree? __________ (Yes or No)
6. Number of agriculture teachers at your school? _________.

Data regarding Farm Management Meetings

1. Teaching time for 1st unit? ________.
2. Teaching time for 2nd unit? ________.
3. Teaching time for 3rd unit? ________.
4. Number of days between 1st unit and quiz? ________.
5. Average number of young farmers attending the 3 meetings? _______.

Young Farmers Reaction to Farm Management
Instructional Units

Note to Young Farmers: Your reaction and suggestion will be taken into consideration when these units are revised. Please read the questions carefully and answer them according to your honest opinion.

Use the following criteria for answering questions 1 through 6.

Very Useful - I feel that the information learned has considerably improved my ability to make decisions and I have already used this information or anticipate using it.

Useful - I feel that the information learned has definitely improved my ability to make decisions and I expect to use this information in the future when making decisions.

Some Value - I feel that I have received some benefit from the information learned and there is a possibility of using this information in the future when making decisions.

Little Value - I feel that I have received little benefit from the information learned and there is little likelihood that I will use this information when making decisions.

No Value - I feel that the information was of no value to me.

1. What is your general reaction to the series of three farm management meetings? (answer if you attended 2 or more meetings) (Check one)

Very Useful ______
Useful ______
Some Value ______
Little Value ______
No Value ______

2. What is your reaction to the first unit on the relationship of goals to decision making? (do not answer if you didn't attend this meeting)

Very Useful ______
Useful ______
Some Value ______
Little Value ______
No Value ______

3. What is your reaction to the second unit on diminishing returns principle and fixed-variable cost relationship? (do not answer if you didn't attend this meeting)

Very Useful ______

Useful ______

Some Value ______

Little Value ______

No Value ______

4. What is your reaction to the third unit on principles of substitution and opportunity costs and profitable enterprise relationships? (do not answer if you didn't attend this meeting)

Very Useful ______

Useful ______

Some Value ______

Little Value ______

No Value ______

5. How useful do you believe the examples were that were used to illustrate the principles and concepts?

Very Useful ______

Useful ______

Some Value ______

Little Value ______

No Value ______

6. How useful do you believe the overhead transparencies were?

Very Useful ______

Useful ______

Some Value ______

Little Value ______

No Value ______

7. What do you believe are the two greatest weaknesses of these units?

1.

2.

8. What do you believe are the two greatest strengths of these units?

   1.

   2.

9. What changes do you believe would improve these units?

10. Other comments.

Young Farmer Questionnaire

No.________

______________________________ Name

______________________________ School

1. Age ________

2. Marital status

Married ________

Single ________

3. Formal education
(H.S. graduate is 12. Include post H.S. vocational training and college)

Years ________

4. Years enrolled in H.S. vocational agriculture. ________

5. Amount of time devoted to farming.

Full - time ________

Part - time ________

6. Status (check one)

Owner ________

Part - owner ________

Tenant ________

Partner ________

Hired hand ________

Working at home ________

7. Years of managerial responsibility
(since you began making managerial decisions) ________

8. Interest in self-improvement

Number of farm magazines you read frequently ________

Number of farm radio programs you listen to daily ________

Number of farm TV programs you watch daily ________

9. Size of farm business

Work Units ________

Make calculations on attached sheet and transfer total work units to No. 9. These should reflect the size of business in 1968. Use livestock numbers on hand at the present time.

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